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AUTHOR Bakke, Ruth
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ABSTRACT

This activity packet for grade 4 is one of a series developed in response to the concern for energy conservation. It contains activities that stress an energy conservation ethic and includes many values clarification activities for grade four. The packet is divided into two parts and provides the teacher with background information, concepts and objectives, and activities for each part. Part one is concerned with energy conversion and part two with energy production and use. Two annotated bibliographies, one for teachers and the other for students, are also included. The teacher is provided with pages for duplication. An evaluation form and a list of resources are also a part of this activity packet. (MA)

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ED146046

ENERGY

Conservation Activity Packet

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Grade 4

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NOTE TO SCHOOLS AND TEACHERS

The filmstrips referred to in the 5th and 6th grade sets can be borrowed from your local AEA. The AEA's have five (5) sets of the filmstrips available. You may wish to make arrangements with them for purchasing a copy of these filmstrips for your own building. The cost was prohibitive for us to include the filmstrips in each packet.

Thank you for your understanding.

ENERGY CONSERVATION ACTIVITY PACKETS

Ruth Bakke
project writer/coordinator

ACKNOWLEDGEMENTS

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The writer and sponsoring organizations also wish to extend appreciation to the many teachers in the Des Moines Metropolitan Area who opened their classrooms for field testing the activities contained in the K-6 Energy Conservation Activity Packets. Their comments and suggestions were greatly appreciated.

Northwest School
Ankeny
- Steve Rue
- Ruth Bond
- Lucretia Smith

Southeast School
Ankeny
- Marge Ranney

Carlisle Elementary School, Carlisle
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- Janine Stoner
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Ardith Jenison
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Joan Betsworth
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Lakewood School
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Jeff Horn
Debbie Snider
Pat Polson

Hillside 6
West Des Moines
Judy Oggero
Sue Pogge

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INTRODUCTION TO ENERGY PACKETS

The energy shortages and emergencies with which we are faced attest the treatment humans have given to their natural surroundings. Not only do we experience personal inconveniences but we also see severe economic and environmental consequences. Our nation has arrived at a time when it needs to reevaluate where it is going, at what speed, and how it will eventually arrive at that goal. The National Academy of Sciences generally agrees that the reserves and resources of domestic oil, gas and coal will satisfy energy needs in the United States until the year 2000. Presently the United States doubles its energy consumption every 13 years. In 1975, electric companies burned 507 million barrels of oil to generate electricity, 500 million barrels were burned to heat factories. Much of the oil and natural gas consumed could be replaced by coal, thus drastically reducing oil imports.

The instructional program in a school can examine this energy situation with reason and logic. When a social issue is integrated into the total curriculum, it helps children to apply what they are learning. The educational process can help students become aware of the alternatives and consequences in regard to energy, then guide them to choose a value. Students can learn that it is just as exciting to make something last as it is to develop something new.

Through use of the enclosed materials and activities, it is our intent to stress a conservation ethic. The conservation ethic means more than turning lights off, it has wider implications such as developing new industries to recycle metals, making more durable products, and prioritizing fuel uses.

Our values show what we tend to do with our limited time and energy. They are related to the experiences that shape them. In order to help children develop clearer values, teachers must help them use the process of valuing. Students become much more purposeful when they have been given opportunities to clarify their values.

Each packet contains values clarification exercises designed to carry out the stated objectives. The teacher may wish to use a specific model to develop more exercises. You will find that the valuing process is another tool for the teacher. When used, it leads children from apathy and confusion toward positive learning and life-styles.

The goal of providing the types of activities, which have been included, is to create a growing awareness for the need of dealing with existing energy problems in a positive way. Individual teachers should select objectives which they feel reflect the needs of a particular class. Each packet contains an energy concept and an awareness or accommodation concept. It is imperative to include objectives from each conceptual area as the purpose of these packets is to develop an energy conservation ethic within the students of today that they

may become conserving and concerned citizens of tomorrow. Changes may not occur immediately due to home and parental values; however, as they become adults, this learning will show its effects.

Each packet includes many activities for the teaching towards the stated objectives. Teachers need choose only those activities which they feel will accomplish their objectives. The teaching of energy and its conservation is designed to be interdisciplinary in order that students see that energy cannot be isolated from our daily lives. This is also important in developing the conservation ethic.

Within the packet, teachers will find transparencies, posters, filmstrips, etc. which may add to the teaching of energy and development of conservation. Suggestions and criticisms from teachers, consultants, etc. would be appreciated and considered in keeping these packets suitable for the majority of school systems.

Most young children in the primary grades are within the concrete operational stage, as named by Piaget. They do not have the ability to separate the abstract from something. Therefore, the activities which have been proposed reflect this and provide for greater awareness, rather than a formal study of energy. Individual teachers know their students best and will need to select items which they feel will be of greatest benefit to the education of the children. This is also the reason the concepts and objectives for the primary grades (K-2) have been combined in one packet. There are some classroom activities which require about 20 minutes each, some 40 minutes, and there are also some activities which can be done at home in order to enable children to work with their families.

ENERGY CONSERVATION ACTIVITY PACKETS

GRADE 4

PACKET "A"

TEACHER BACKGROUND MATERIAL
Grade 4 - Packet "A"

The First Law of Thermodynamics states that "energy can neither be created nor destroyed." The Second Law of Thermodynamics says that "in any conversion of energy from one form to another some of it becomes unavailable for future use." Energy is not consumed in our society, it flows through it. This can be seen in the instance of fossil fuels. They are not only sources of energy but provide raw materials for many products. All natural energy conversions are irreversible. The energy converted from one form to another cannot be completely converted back to its original form. Waste heat from energy conversions is discharged into the atmosphere or into rivers and lakes. It is given off by electrical wires, lost from homes and buildings, and lost into the atmosphere by inefficient automobiles. In the end, all of our primary energy ends up as heat and is radiated away to warm the universe.

You may wish to utilize the learning center approach during the study of energy, therefore, in Packet "A" you will find materials and suggestions for this type of approach. The teacher is free to use the materials in any manner which will provide the most educational experience for the students.

Many of the activities in the 4th grade packets require between 20 and 40 minutes depending upon the length of discussion. Some of the activities are designed to be done at home and follow-up provided in the classroom.

CONCEPTS AND OBJECTIVES IN ENERGY CONSERVATION

Grade 4 - Packet "A"

Energy

1.00 The learner becomes aware that energy can be changed from one form to another--conversion.

1.1 Describes the transfer of energy in living systems.

1.2 Identifies certain civilizations which used only conversions related to wind, fire, falling water, and muscle power.

1.3 Sees that a machine changes energy from one form to another.

1.4 Recognizes that living organisms change energy from one form to another.

Personal Accommodation

2.00 The learner will develop a conservation ethic in regard to energy.

2.1 Acquires experience in making decisions and accepting the consequences of the decisions.

2.2 Expresses personal value that is received from energy conservation.

2.3 Chooses activities which will utilize conservation of energy in making contributions to the school and community.

2.4 Develops an idea of the type of life-style desired in consideration of the amount of energy required.

2.5 Relates implications for energy conservation to the impact upon natural and man-developed resources.

ENERGY ACTIVITIES
Grade 4 - Packet "A"

1.00 Learner becomes aware that energy can be changed from one form to another--conversion.

1.1 Fill a teakettle with water and heat until the water boils. When the steam begins to rise, hold a pinwheel over the spout. Relate the experiment to generators and discuss how heat energy is converted to electrical energy.

1.1 Credit: My Energy...is Your Energy, Arizona Department of Education, 1974.

A basic principle of energy is evident in popping popcorn. In each kernel of corn there is water and when it is heated it converts to steam. The steam expands and pushes against the skin of the kernel. The kernel soon explodes and you see the white starch of the inside. Now you can eat the experiment! As you do, notice the conversion of butter from solid to liquid when subjected to heat energy.

1.1 Take a walk with the class to observe conversions of energy. The class uses a list with three columns indicating object, energy source, and product. This list is filled as they proceed on their walk. (Use *Data Sheet #1*) Upon return to the classroom the class can discuss their lists and notice whether anyone noticed something which no one else saw.

1.1 Use pictures of things the children are familiar with, such as guitar, toaster, lump of coal, flashlight. For each one, discuss how the energy changes from one form to another. If pictures are not available, use *Transparency #1*.

a. Guitar--energy of motion (mechanical) changed into sound energy.

b. Toaster--electric energy changed into heat (thermal) energy and light energy.

c. Lump of Coal--chemical energy changed into heat (thermal) energy and light energy.

d. Flashlight--chemical energy changed into electric energy and light energy.

Students could locate pictures of other items and explain the change of energy--orally, or through drawings.

1.1, 1.4 Set up a balanced aquarium and notice how the energy is converted from one form to another.

Civilizations with Simple Conversions

1.2 Students compare the sources and uses of energy in a hunting society, a primitive agricultural society, and our own society. Then discuss whether our society should become more, or less, energy intensive.

1.2 Have the students research a day in the life of an Eskimo. Write a short play which will depict his activities during the day. Present the play to another group and then discuss what energy conversions were used. This activity and the following one can be adapted to any culture you may be studying in social studies.

1.2 The children can prepare research on a nomadic tribe and then try to reconstruct a day in their lives. The activities of the men, women, and children should be considered. Role-play a scene around an evening campfire where several of the members of the tribe talk about their activities in such a way that it shows the energy conversions used. This role-playing might also be done with puppets.

Machines Change Energy from One Form to Another

1.3 Each student brings in an example of a machine and shows how it moves or changes something.

1.3 Discuss why people and animals are like machines.

1.3 Let the students construct and fly a kite. Ask, "What is the energy source? Is there any conversion before it is used?"

1.3 Conduct an experiment with a flat sled and a roller skate. Attach twine to the sled and to the skate, then put books or other weights on each one. Volunteer students pull the sled and the skate. Which is easier? Which can do the most work? Load them both until the string snaps. With which machine is more energy used?

1.3 Collect and display toys which show as many conversions of energy as possible. Example: trace back electricity from making the electric train work back to utility company and even back to original source. List the energy conversions. Simpler toys have fewer conversions.

1.3 Each of the five forms of energy can be converted to another form. This is done with the use of a conversion device. Use the toaster as an example of a device which converts electrical energy into heat energy. The children can prepare toast and explain the conversion they see. List some conversions and have students name the conversion device used for each one.

a. Electrical to sound (telephone, radio)

b. Chemical to heat (fossil fuel, match)

c. Electrical to heat (spark plug, toaster)

1.3 Coal is burned and releases heat energy to set water boiling and changes it into steam. The steam rushes through pipes and hits the propeller-like blades on a turbine shaft. The mechanical energy which was produced by a rotating shaft sets a generator to producing electricity. (*Transparency #2*)

1.3, 1.4 Use *Transparency #3* to help the class discover how humans have created extra energy steps in their need to get somewhere faster. Discuss, then let the class share thoughts as to what could be done to eliminate some of the extra energy steps.

Living Organisms Change Energy from One Form to Another

1.4 Demonstrate to the class how burning wood converts the energy which is stored in the wood into heat energy and light energy.

1.4 Discuss food chains or food webs. Students trace energy sources and discuss the conversions which occur.

2.00 Personal Accommodation: The learner will develop a conservation ethic in regard to energy.

Making Decisions, Accepting Consequences

2.1 Have students compare light bulbs (florescent and incandescent). Do this carefully and warn the students that when they touch things they do it quickly and be careful not to get burned. First let them feel both types. Which type seems to give off the most heat? Secondly, let the students graph the length of time it burns and temperature released. From this the students could discuss actions they could take.

2.1 Bring in a variety of waste products (egg cartons, scrap material, cans, etc.). Let the students first list at least 10 uses they can think of for one of the waste products. Then have them consider what energy must be utilized in the process of recycling--encourage them to select a use for the product which uses the least amount of energy. Discuss what they have thought of and also discuss other alternatives to dealing with the waste problem. Display some of the results of ideas for recycling waste products--let the children use their imaginations!

Personal Value from Energy Conservation

2.2, 2.3 Students set up a display showing ways to save energy by using fewer conversions. This display should be placed in a public library, shopping mall, or area through which many people pass.

2.2, 2.3 Students write child-authored books on the topic of energy conversion and energy conservation. These can be shared with other grade levels and could also become a part of the library.

2.2, 2.3 Credit: A Teacher's Handbook on Energy, Colorado Department of Education, Denver, Colorado 80203.

Develop with the class a list of 15-20 pairs of alternative ways of doing things commonly found in our way of life, such as the following:

a. Dishwasher vs. doing dishes in the sink

b. Fan vs. air conditioner

c. Power mower vs. hand mower

d. Electric razor vs. blade razor

e. Bath vs. shower

f. Gas stove vs. electric stove

g. Electric sweeper vs. broom

h. Automobile vs. bicycle

Ask the students, working in pairs, to select one of the alternatives and to compare/contrast the amount of energy used and the benefits received from the alternative they have selected. Encourage students to think seriously about the advantages of both alternatives. Ask each pair of students to identify to the class the alternative they prefer and then see if the class supports or does not support their choice.

	Dishwasher		Dishes in Sink	
Student Model, i.e.	Adv.	Disadv.	Adv.	Disadv.

Energy Conservation in School and Community

2.3, 2.4, 2.5 How do you know when you really are saving energy and when you are using too much? Guidelines will help you know.

a. Stay as close to the source of things as possible.

b. Buy and use long-lasting, efficient products.

c. Look at the whole energy picture of things you use.

Show *Transparency #4* to help children visualize this. Have them choose another product and draw a pyramid for it.

2.3 The class can prepare a skit or play about energy and energy conservation. Light the stage only with candles or flashlights. This could be presented in a number of ways: another class, the entire school, or to parents.

Life-Styles and Energy

2.4 Draw a mural depicting the major means of heating homes in the year 1850, 1950, 2050. Field trips or resource people will serve as excellent sources for the first two dates. Imagination serves well for the future date!

2.4 Students interview other people to find out what the "good life" is. Interviews should include adults and fellow students. These interviews could be taped and then discussed by the students.

Implications for Energy Conservation

2.5 A large portion of energy is used in the packaging of such food items as cooking oil in aerosol cans, flavorings, TV dinners, frozen foods, canned beverages. There are some energy conserving practices which would also increase the amount of nutrition available for consumers. Have the students determine these energy conserving practices and take action if they feel action is needed. Action could include letters, distributing posters, speaking to groups, etc.

Some energy conserving practices:

a. Home gardening.

b. Fruit growing.

c. Eat more vegetables and less meat.

d. Reduce the use of over-processed food.

e. Purchase beverages in the returnable containers.

f. Purchase more unpackaged foods.

g. Encourage development of more stores which allow you to bring in your own containers.

LEARNING STATIONS TO HELP CHILDREN FIND ENERGY SAVING PRACTICES

Station #1

Wise Use of Water

Materials: reference books and/or pamphlets on water conservation and home energy conservation, experiment sheets (*Masters #1, 2, 3*)

Directions: These experiments need to be done at home. Take one worksheet home, complete it, and return it to the basket on this table. Then take another worksheet and do the same. You need to complete two of these experiments before you proceed to the next station.

Station #2

Insulation

Materials: ice cubes, water glass, "fish tank" thermometer, cardboard box (just large enough for the water glass), cotton balls, fruit juice cans, black paint, brush, newspapers, styrofoam packaging material, cloth, plastic, insulating material from local contractor, direction sheets for the experiments (*Masters #4, 5, 6*)

Directions: Read direction sheets carefully. Some of these can be done at school while others should be completed at home. When you have completed an experiment, put your sheet in the basket on this table. You need to complete two of these experiments before you proceed to the next station.

Station #3

Packaging Practices

Materials: experiment sheets, display of types of packaging available today in the stores, scale (*Masters 7, 8, 9, 10*)

Directions: Read the experiment sheet carefully. Some of these are to be done at home, some at both home and school. When you complete an experiment, put your sheet in the basket on the table. You need to do two experiments before going to the next station.

Station #4

Household Appliances

Materials: experiment sheets (*Masters 11, 12, 13, 14, 15, 16*), glue magazines, catalogs, home appliance advertisements, white drawing paper

Directions: Read the experiment sheets carefully. Some of these are to be done at home and others at school. When you complete an experiment, put your sheet in the basket on the table. You need to do two experiments before going to the next station.

The teacher determines the time limit for each station. This will help the students to organize and keep moving on the experiments.

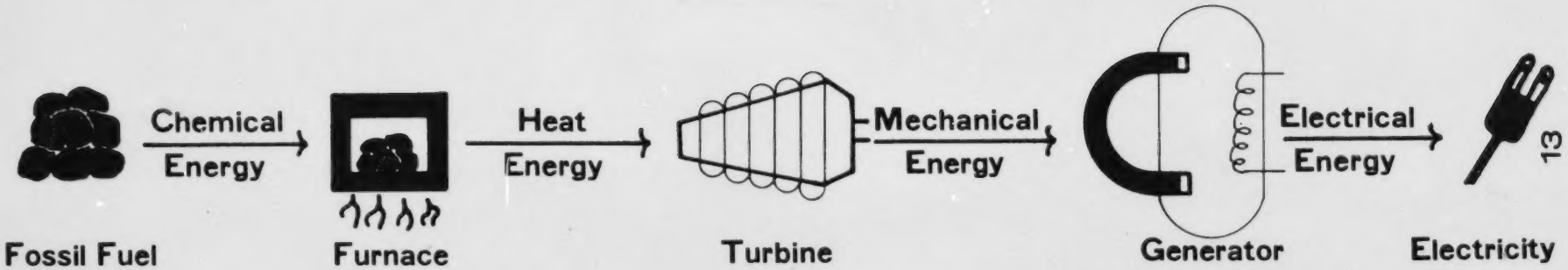
WALK TO FIND ENERGY

	Object	Energy Source	Product
(example)	car	gasoline	motion

Energy Activities
Grade 4
Packet "A"
Transparency #1
1.1

19

STEAM GENERATING PLANT



Energy Activities
Grade 4
Packet "A"
Transparency #2
1.3

Energy Activities
Grade 4
Packet "A"
Transparency #3
2.3, 2.4, 2.5

ENERGY STEPS

a bear gets up and walks there

a bear needs to go somewhere

WHEN A BEAR

NEEDS TO GO SOMEWHERE

person drives it where he needs to go

person drives it to service station for maintenance

person drives it continuously to gas station for fuel

person buys a car

person drives or rides to dealer

transport it to car dealers nationwide

assemble the car

make plastics into seats and knobs

make plastics for interior furnishings from petroleum

make steel into auto parts

transport steel to auto plant

make ore into steel

transport ore to steel mill

mine for iron ore

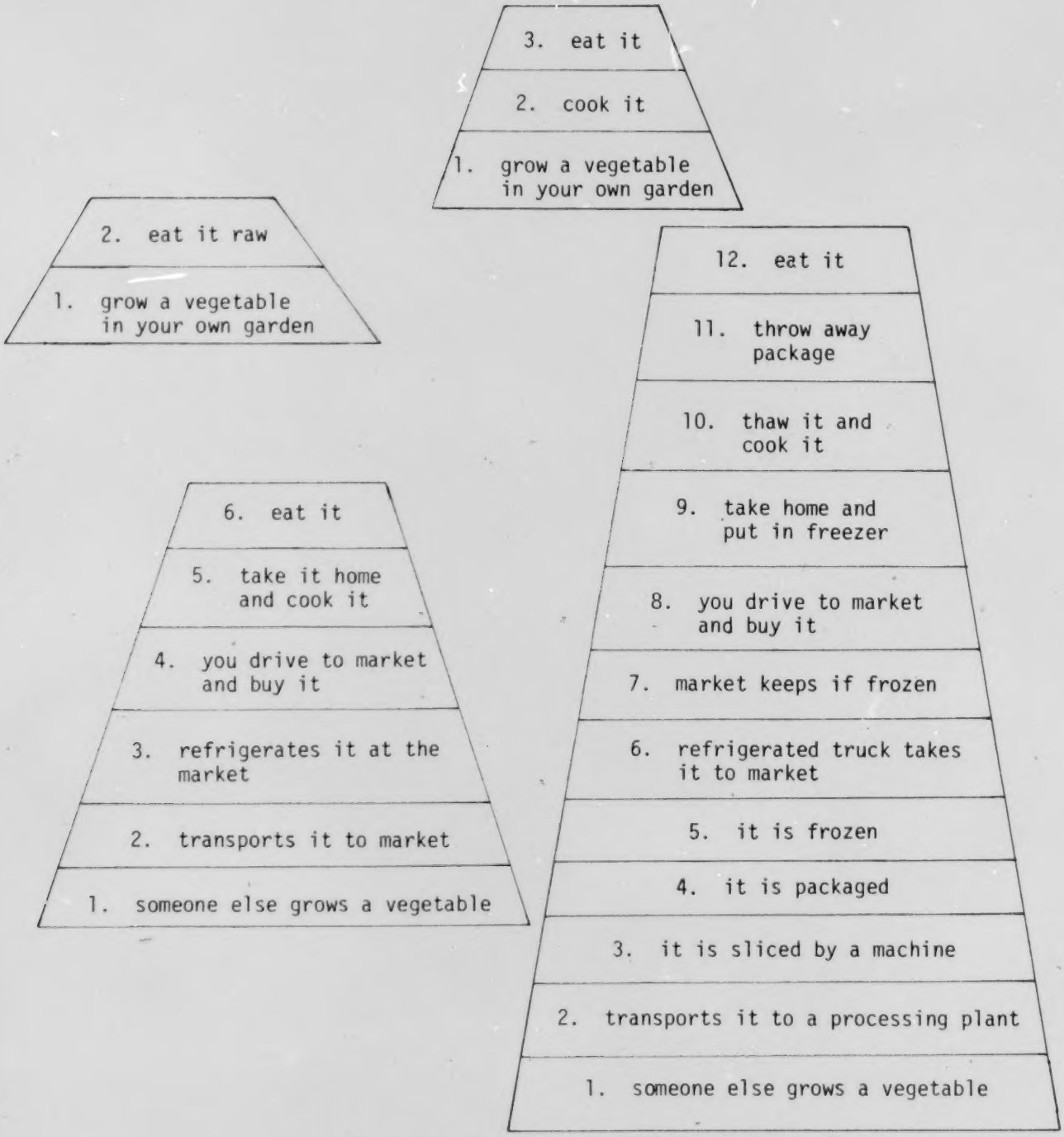
a person needs to go somewhere

WHEN A PERSON

NEEDS TO GO SOMEWHERE

Energy Activities
Grade 4
Packet "A"
Transparency #4
2.3, 2.4, 2.5

WHICH BUDGET IS BETTER?


3. eat it
2. cook it
1. grow a vegetable in your own garden
2. eat it raw
1. grow a vegetable in your own garden
12. eat it
11. throw away package
10. thaw it and cook it
9. take home and put in freezer
8. you drive to market and buy it
7. market keeps if frozen
6. refrigerated truck takes it to market
5. it is frozen
4. it is packaged
3. it is sliced by a machine
2. transports it to a processing plant
1. someone else grows a vegetable
6. eat it
5. take it home and cook it
4. you drive to market and buy it
3. refrigerates it at the market
2. transports it to market
1. someone else grows a vegetable

Energy Activities
Grade 4
Packet "A"
Master #1
Learning Station #1

DIRECTIONS

Learning Station #1

These experiments need to be done at home. Take one worksheet home, complete it, and return it to the basket on this table. Then take another worksheet and do the same.

You need to complete two of these experiments before you proceed to the next station.

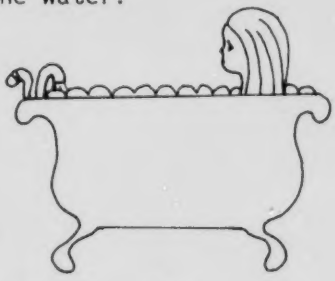
SHOULD YOU SHOWER OR BATHE?

Things you need: your bathtub, a yardstick, a bar of soap (optional)

*A surprising fact is that if people took showers instead of baths a lot of energy would be saved.

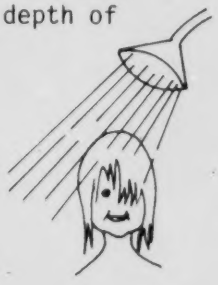
TAKE A BATH. Fill your bathtub with water as usual. Before you step into the tub, measure the depth of the water.

Bath water _____ inches



TAKE A SHOWER. Do this when you need one! Before you begin, close the bathtub drain so the shower water will collect in the tub. When you have finished with your shower, measure the depth of the water that has collected.

Shower water _____ inches



What is the difference in the amount of water you used? _____

*It takes about an ounce of oil (or a cubic foot of gas, or 1/4 kilowatt hour of electricity) to heat a gallon of water. Showering saves lots of energy!

Energy Activities
Grade 4
Packet "A"
Master #3
Learning Station #1

A LITTLE DRIP A BIG WASTE

Things you need: an 8 oz. glass or plastic graduated measuring cup, pencil, paper, leaky faucet (optional), clock

Each drop of water from a leaky faucet is tiny but it adds up to thousands of gallons of water dripping from the faucet each year. If it is hot water that is leaking we are also wasting the energy used to heat the water.

If you do not have a leaky faucet, adjust your sink faucet to produce a steady drip. Place the measuring cup beneath the dripping faucet and collect 15 minutes worth of drip. (You might, for example, collect 4 ounces of water in 15 minutes.) Now comes the mathematics so get your paper and pencil! (We'll use the 4 ounce figure in our example.)

Step 1: Multiply the number of ounces of water by 4--this gives you the number of ounces per hour leaking through the faucet.

4 ounces x 4 = 16 ounces per hour

Step 2: Multiply the answer from Step 1 by 24--this gives the number of ounces per day leaking through the faucet.

16 ounces per hour x 24 = 384 ounces per day

Step 3: Multiply the answer from Step 2 by 365--this gives the number of ounces per year leaking through the faucet.

384 ounces per day x 365 = 140,160 ounces per year

Step 4: Divide the answer from Step 3 by 128--this gives the number of gallons per year leaking through the faucet.

140,160 ounces per year ÷ 128 = 1095 gallons per year

*What if your drips are hot? How much energy was wasted then?

Gas fired water heater: Multiply the answer from Step 4 by 0.84.

1095 x 0.84 = 920 cubic feet of gas per year

Oil fired water heater: Divide the answer from Step 4 by 110.

1095 ÷ 110 = 9.95 gallons of oil per year

Electric hot water heater: Multiply the answer from Step 4 by 0.25.

1095 x 0.25 = 274 kilowatt-hours per year

Attach your paper to this sheet when you hand it in.

Energy Activities
Grade 4
Packet "A"
Master #4
Learning Station #2

DIRECTIONS

Learning Station # 2

Read the worksheet directions carefully. Some of these can be done at school while others should be completed at home. When you have completed an experiment, put your sheet in the basket on this table.

You need to complete two of these experiments before you proceed to the next station.

Energy Activities
Grade 4
Packet "A"
Master #5
Learning Station #2

Which is the better

INSULATOR?

Things you need: four or five fruit juice cans, ice cubes, magic marker, items for insulation (as indicated below)

Take four or five fruit juice cans. Place an ice cube in each can and place a number on each can.

Can #1 - no insulating material (leave as is)
Can #2 - paint outside of can black
Can #3 - use styrofoam packaging material
Can #4 - use newspapers, the same thickness as the styrofoam
Can #5 - choose one of the other insulating materials from the box

Place all cans either in the sun or in the shade. Check the ice cubes every 15 minutes until the first ice cube has melted. Continue to check until all ice cubes are melted. Record the time it takes to melt each ice cube.

	Time
Can #1	____
Can #2	____
Can #3	____
Can #4	____
Can #5	____

Insulation used _____

Energy Activities
Grade 4
Packet "A"
Master #6
Learning Station #2

How Does INSULATION Work?

Things you need: small water glass, "fish tank" thermometer, cardboard box (corrugated cardboard and large enough to hold the water glass), cotton balls

*Insulation in the walls of a home slows down the movement of heat from the inside to the cold outdoors.

Step 1: Fill the glass with water that is at room temperature (about 70° F). Use the thermometer to measure the exact temperature.

Step 2: Put the thermometer into the glass, then put the glass into the refrigerator.

Step 3: Check the water temperature every five minutes.

Check #1 _____
Check #2 _____
Check #3 _____
Check #4 _____
Check #5 _____

Why does the water temperature drop so quickly? Heat flows out of the warm mass into the cold air inside the refrigerator. Let's add insulation to see what it does.

Step 1: Refill the glass with water at room temperature.

Step 2: Place a layer of cotton balls inside the bottom of the cardboard box and rest the glass on top of the layer of cotton.

Step 3: Pack the empty space between the glass and the sides of the box with cotton balls.

Step 4: Repeat as you did for the first part of the experiment.

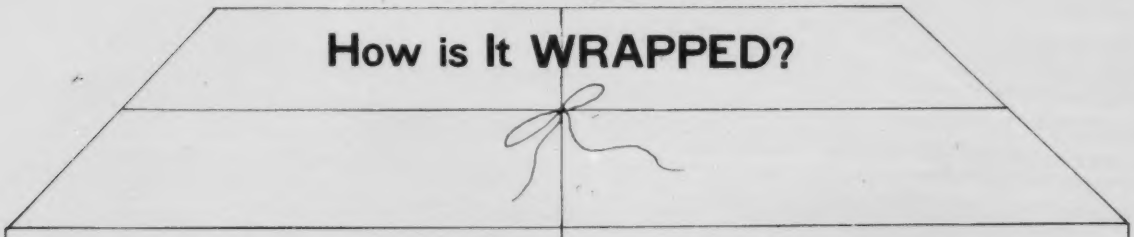
Check #1 _____
Check #2 _____
Check #3 _____
Check #4 _____
Check #5 _____

Did your "insulation" cause the water temperature to drop less?

DIRECTIONS

Learning Station # 3

Read the experiment sheets carefully. Some of these are to be done at home, some at both home and school. When you complete an experiment, put your sheet in the basket on the table. You need to do two experiments before going to the next station.



How is It WRAPPED?

When you go shopping with Mom, check to see how the following items are wrapped. Write down what you see.

Meat -

Lettuce -

Oranges -

Toothpaste -

Aspirin -

Potato Chips -

*In many countries of the world food is not packaged as it tends to be in the U. S. The shopper brings her own grocery bag to market and places the unwrapped head of lettuce, unbagged oranges, and meat wrapped only in butcher paper directly into her bag.

Interview your mother, using the following questions.

INTERVIEW WITH MOM

1. Would you use the simpler system found in other countries?
2. What problems do you see?
3. Do you think our present system should be kept?
4. Are you concerned about the amount of packaging materials you now throw away?
5. Do you think the simpler system would save money and energy?

If you believe there is too much overpackaging, write a letter stating your concern to your supermarket manager. Either mail it or hand deliver it.

Look through one of your weekly grocery bags. List the packaging you find and bring the unnecessary packaging to school. Glue the packaging on a sheet of construction paper in a type of collage. Put your name on your collage, staple this sheet to it, and put it in the basket.

	Item	Packaging
(example) 1.	toothpaste	carton and tube
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

DO RETURNABLE BOTTLES SAVE ENERGY?

You will need to read the following material in order to answer the questions. Then write a letter to a local or nearby bottling company and ask if they feel it saves money and energy to have returnable bottles. When you get an answer, attach it to this paper. Do you agree with them?

*The purchase of a six-pack of soft drinks in returnable bottles instead of no-deposit no-return containers will save the energy equivalent of .25 liters of gasoline. The saving of 0.25 liters of gasoline can take the average family car about 2 1/2 miles. In addition, when the empty bottles are returned for a 30-cent deposit, the six-pack purchase will have cost 18 cents less than for throw-aways.

1. If each family in the class purchased one six-pack of returnable bottles each week for one year, how much energy in gasoline will be saved?

2. Using the figure from #1, how many miles of automobile travel are possible with the energy which is saved?

3. How much money is saved?

4. Why do you think so many people still buy beverages in throw-away containers?

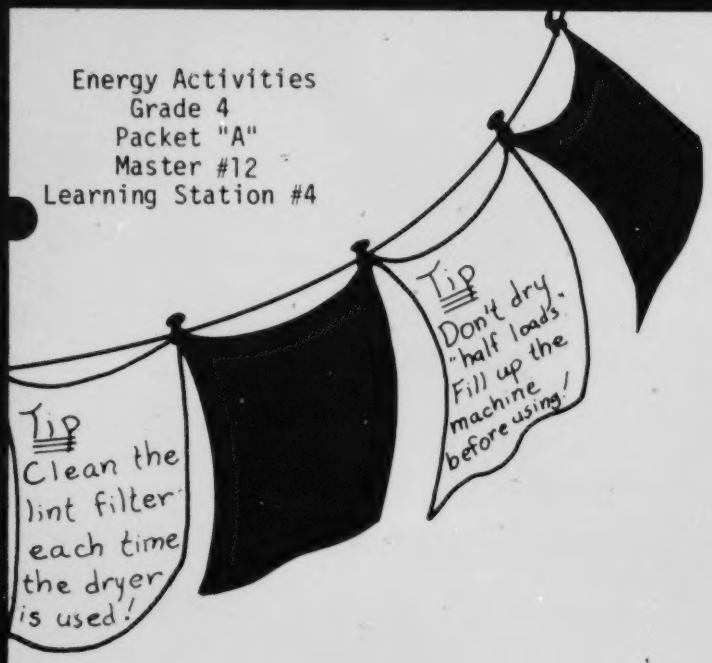
5. What do you think the government or people should do about this matter? What will you do?

DIRECTIONS

Learning Station #4

Read the experiment sheets carefully. Some of these are to be done at home and others at school. When you complete an experiment, put your sheet in the basket on the table. You need to do two experiments before going to the next station.

Energy Activities
Grade 4
Packet "A"
Master #12
Learning Station #4



Does Your Clothes Dryer Waste Energy?

Things you need: About one hour of spare time on washing day, a clock

Step 1: Get permission from Mom! Learn how to restart the machine after you stop it by opening the door. Now you are ready to begin.

Step 2: When your mother puts the next load in the dryer, pull up a chair and watch the clock.

Step 3: After 15 minutes goes by, open the dryer door, wait for the drum to stop turning, then feel the clothes. They will probably still be damp.

Step 4: Close the door and restart the dryer.

Step 5: Do this again every five minutes until the clothes feel dry to your touch.

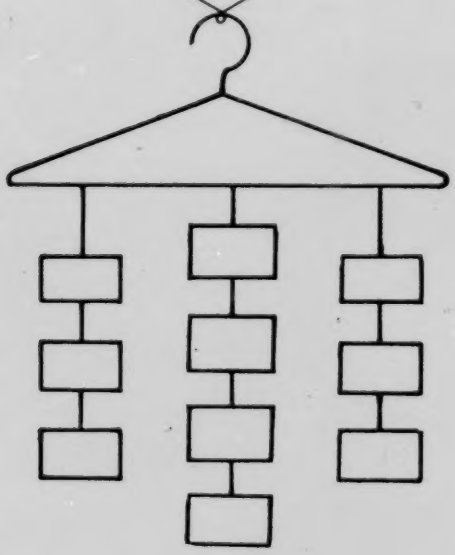
Step 6: Look at the timer to see how much longer the dryer was set to run.

*Electric dryer - every wasted minute burned up about 4/5 ounce of oil.

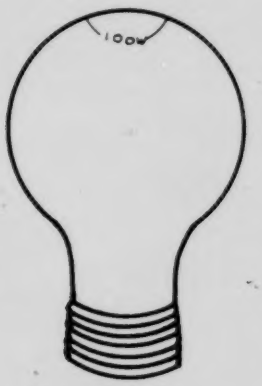
*Gas dryer - every wasted minute burns about 1/10 cubic feet of gas.

necessary and LUXURY home appliances

1. Use catalogs, magazines, and advertisements for cutting out pictures of things that need electricity. Bring a picture of your home and one of your family to school.
2. Divide your cut-out pictures into two groups: those your family needs and those "extras" they want.
3. Now choose the 10 electrical items you feel are necessary for your family.
4. Make a collage or mobile using your photos and the 10 pictures.



Energy Activities
Grade 4
Packet "A"
Master #14
Learning Station #4



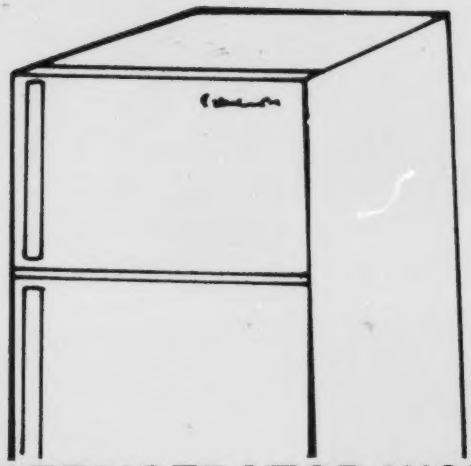
LIGHT AND ENERGY

Things you need: yardstick or tape measure, pencil, and this paper

LIGHTING CHECKLIST

___ Bulbs and lampshades free of dust and dirt?
___ Lampshades translucent (so light can pass through them) rather than solid?
___ Ceilings light-colored?
___ Walls light-colored?
___ "Non-critical" lighting levels kept as low as possible?
___ Does every member of your family turn off lights after he or she leaves a room?

*NOTE: A light bulb consumes less energy during its starting stage than during a single second of normal operation! Always turn lights off when they are unnecessary, even for a few seconds.



HOW DOES YOUR REFRIGERATOR WORK?

Things you need: an "outdoor" thermometer that reads as low as 30° F, a large bowl or pot, your refrigerator, clock

*Everyday Mistakes which make our refrigerators work harder:

1. Putting warm things in the refrigerator.
2. Opening the refrigerator door more times than necessary.

Step 1: Put your thermometer in the refrigerator, close the door, and wait 15 minutes.

Step 2: Open the door and quickly read the inside temperature. It will be about 40° F. _____

Step 3: Unplug the refrigerator from the wall. Wait 15 minutes then open the door and take a temperature reading. _____

Step 4: Plug the refrigerator back in and wait 15 minutes.

Step 5: Unplug the refrigerator again and every five minutes open the door for 30 seconds. After 15 minutes check the thermometer again. _____

Step 6: Plug the refrigerator back in and wait 30 seconds.

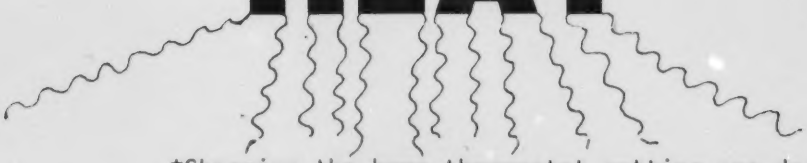
Step 7: Fill your bowl or pot with hot water from the kitchen faucet.

Step 8: Unplug the refrigerator and place the bowl of water inside. Close the door. In 15 minutes take a temperature reading.

_____

LOWER $AVE MONEY!

HEAT



*Changing the home thermostat setting one degree will generally change heating requirements by about 3 percent. Reducing the setting from 70° F to 69° F will save 3 percent and changing it to 68° F will save 6 percent.

Step 1: Take this information home to your parents.

Step 2: Try to get from your parents the cost of heating their home during the past heating system period.

Step 3: Find the number of degrees (if any) the present thermostat setting differs from that of the previous year.

Step 4: Calculate the possible savings by reducing the thermostat to 67° F or 68° F from the one used in the past.

_____ percent saved

Is the savings worthwhile? _____

Can the family live comfortably? _____

Do your parents believe lowering home temperature is a good idea? _____

ENERGY CONSERVATION ACTIVITY PACKETS

GRADE 4

PACKET "B"

TEACHER BACKGROUND MATERIAL
Grade 4 - Packet "B"

About one third (3,000 hours per year) of a person's time is left for recreation after school, sleep, and working around the house. Hobbies, travel, sports, hiking, etc. are all desirable but they also all require energy. Some types of recreation use only human energy while others use a combination of human and machine. Fishing may seem to require very little fuel but some people fly or drive great distances to get to a good fishing hole. Use of leisure time is a personal matter but thought should go into the amounts of energy consumed in each activity and changes made if necessary.

During the 1973 oil embargo, people began to understand how closely energy is tied to, and interwoven in, daily life. Energy prices rose and automobile buying habits of Americans changed. Private citizens were called upon to reduce thermostat settings, reduce travel, and lower highway speed. These measures minimally altered life-styles. However, demand has increased and consumption of electricity doubles almost every 10 years. The crisis brought attention to the problems of diminishing energy resources, increased dependence on imported oil, and environmental costs.

Energy is necessary for comfort, communication, and transportation. The industrialized nations are the large consumers of energy. High standards of living have resulted in high per capita consumption.

Many of the activities in the 4th grade packets require between 20 and 40 minutes, depending upon the length of discussion. Some of the activities are designed to be done at home and follow-up provided in the classroom.

CONCEPTS AND OBJECTIVES IN ENERGY CONSERVATION

Grade 4 - Packet "B"

Energy

1.00 The learner considers energy, its production, use and conservation as essential in the maintenance of our society as we know it.

1.1 Expresses an understanding of energy needs.

1.2 Expresses an understanding of the energy shortage.

1.3 Becomes aware that humans in some technological cultures greatly increased their consumption of energy in recent years.

1.4 Considers that human beings use energy to create special ecosystems such as cities, etc. at the expense of natural ecosystems.

1.5 Recognizes that energy is closely related to transportation, consumers, industry, etc.

1.6 Discovers uses of energy in commercial, industrial, residential, and transportation areas.

1.7 Discovers ways in which human beings use energy in leisure time activities.

1.8 Formulates value judgments concerning their life-styles and energy utilization.

Personal Accommodation

2.00 The learner will develop a conservation ethic in regard to energy.

2.1 Acquires experience in making decisions and accepting the consequences of the decisions.

2.2 Expresses personal value that is received from energy conservation.

2.3 Chooses activities which will utilize conservation of energy in making contributions to the school and community.

2.4 Develops an idea of the type of life-style desired in consideration of the amount of energy required.

2.5 Relates implications for energy conservation to the impact upon natural and man-developed resources.

ENERGY ACTIVITIES
Grade 4 - Packet "B"

1.00 The learner considers energy, its production, use and conservation as essential in the maintenance of our society as we know it.

Understanding Energy Needs

1.1, 2.1, 2.4 Divide the class into groups of five with each group representing a family of five: father, mother, and three children. The groups are told that because of a very critical shortage of natural gas and fuel oil, their winter heat allocation is being reduced. Challenge each group to prepare the best list they can of how they will deal with the problem. Ask them to think about and list what they can do to keep heat in or cold out of their homes. What can be done by the father? The mother? The children? How can they still be comfortable if they reduce the temperature? (Use *Sheet #1*) Students will see that every family member can be involved and helpful in confronting such a problem.

1.1, 1.2, 1.8 Pretend that a major disaster has hit the community! The sources of electric power and water have been damaged. Describe what activities your family would participate in under these conditions. Underline each activity that is normally performed by power.

1.1, 1.2 Use the following list of words as a vocabulary list and add to it throughout the study. These could be alphabetized, etc. This would be a good language arts lesson.

blackout
energy
energy crisis
fuse
generator
petroleum
fossil fuel
hydropower

1.1 Supply each child with a copy of *Master #1*. If you think your class could accomplish this better as a small group activity then do it in that manner. They should attempt to list more examples of energy users and for each item they check the forms of energy that power the user.

Understanding of Energy Shortage

1.2 The following activity should help children see that shortages result from the relationship of a product's value to its availability. Mark off a grassy area somewhere around the school building (about 10' x 20'). In the grass scatter 150 colored gumballs or marbles (25 each of red, green, white, black, blue, orange). Set a time limit and see how many the students can recover. Have the children explain why certain colors were more difficult to find.

a. What products can you think of that are high in price because they are in short supply?

b. What raw materials are high in price because they are wanted by so many people for so many things?

1.2 Either read to the class or obtain enough copies to assign as a reading lesson, the reprint from Ranger Rick, "The Best Present of All." A single copy is available free from the National Wildlife Federation, 1412 Sixteenth Street, N.W., Washington, D.C. 20036. The class may wish to present it as a play or even a puppet show.

1.2 Announce to the class that there are no more paper towels and no more drawing paper. Ask them to think of ways these problems can be solved without using money and more energy. These ways can be listed and the better ones actually tried for a specified period of time.

1.2 Ask the principal's permission to set aside one day for minimum usage of electricity. Only cold lunches would be eaten; no audiovisual equipment would be used; there would be no bells, electric clocks, intercom. At the end of the day ask the children to write down their thoughts and feelings.

Humans Increase Consumption

1.3, 1.6 Have the students speculate and list five reasons why stores and offices today use almost twice the electric energy as they did 10 years ago. Stores and offices may be contacted to obtain firsthand information.

1.3, 1.4 Have the students discuss what they would do with the time they normally watch television, if they were not allowed to watch television as much. They could list activities they would participate in, then decide for each activity whether they were using more or less energy.

1.3, 1.4 The children discuss how buying a house, car, toys, appliances, etc. is related to the energy crisis. How could buying habits change in order to ease the energy shortage?

1.4 Ask students to bring in toys. Then let them attempt to find answers for such questions as:

a. How long has this item been on the market?

b. Was it marketed to fill a need or did it create its own need?

c. Can you think of other things to do that require less energy?

d. Did the children in colonial days have the same needs for recreation as we have today? What did they use?

They could then set up a display showing electrically powered toys compared to the non-powered counterparts.

1.4 Use the information on *Transparency #1* to discuss how man uses energy to create his own systems and thus sometimes causes a change in natural systems. Take a walk to find specific local examples of this.

1.4, 1.5, 1.6 Have the students contact the local utility company to help you calculate the proportion of power used in your city by industrial, commercial, and residential users. Compare the power use of a large city with that of a small one.

1.4, 1.7, 2.4 Invite a local grandmother or grandfather to discuss how energy use has changed during his or her lifetime.

1.4, 1.7, 2.4 Obtain a number of old and new magazines. Compare the different energy uses portrayed in each.

1.4, 1.5, 1.6 Each student should choose a city they would like to travel to. Then they can prepare written directions for traveling from one city to another by bus, train, auto, or airplane. They will need to check with the offices of these transportation companies so that it will be as accurate as possible with directions to terminals. Choose a few students to read their directions.

a. Which method of travel offers the easiest set of directions?

b. Which method do you think would be the fastest? The slowest?

c. What restriction has been placed on automobile travel?

d. Are the public transportation facilities as good as they should be? Why or why not?

e. Which method of travel is the most expensive? Why?

1.4 Continue learning more about transportation. Find out what the major means of transportation are in your community. Visit as many of these places as possible, examine the facilities, compare cost per person for the various types of transportation, ask if more people are using this particular form of transportation than one year ago.

Energy Related to Transportation, Consumers, Industry

1.5, 1.6 The class should be taken to an intersection, using all proper and necessary precautions. They should use *Survey Sheet #2* to tally the number of each type of vehicle they see in a 10 minute period. This should be done daily for one week. Compile information on a chart, or simple graph. Discuss how energy is used in the area of transportation.

1.5, 1.6 Conduct a survey of bike and car use by students in the school. Include questions about why more students don't ride bikes. The class presents findings and recommendations to the student council and administration. Divide the class into as many groups as there are grade levels. (*Survey Sheet #3*)

1.5, 1.6, 2.4, 2.5 Students pretend they are a family that has just learned they are to conserve gasoline. Role-play the family's efforts.

a. What are gasoline necessities? Luxuries?

b. Whose needs should be served first?

1.5, 1.6 Have the children write a story about transportation in the future. This should be after a discussion of what is happening now and provide a basis for making careful predictions about the future. The story should include the need for new transportation, possible costs, and types of energy used to operate the vehicles.

1.5, 2.4 Credit: Energy, Michigan United Conservation Clubs, P.O. Box 30235, Lansing, Michigan 48909.

Many of the life-styles that Americans choose require the use of private automobiles. An experiment in West Germany had two drivers sent on a 1,000 mile trip. They had identical cars but one was a slow driver and one was a fast driver. Results: (*Transparency #2*)

	Slow Driver	Fast Driver
Distance covered	1,000 miles	1,000 miles
Elapsed Time	20 hr., 43 min.	20 hr., 12 min.
He passed	645 cars	2,004 cars
He was passed by	142 cars	13 cars
He used brakes	652 times	1,339 times

Discussion for the transparency:

a. How much time did the fast driver save? (31 minutes out of 20 hours)

b. How many more times did the fast driver have to apply the brakes?

c. The fast driver had three times the accident exposure so had more wear and tear on himself. He also used 10 gallons more of gasoline. Used 55 cents as the average price per gallon of gas. How much money did the slow driver save? ($ .55 x 10 = $5.50)

d. You can add four miles per gallon to your mileage by driving 50 mph instead of 70 mph.

Uses of Energy in Commercial, Industrial, Residential, Transportation Areas

1.6, 1.8, 2.4 Distribute copies of *Master #2* to students. This contains some common household appliances which are operated by electricity. Ask the children to put a check (✓) by those items they have in their own homes, and to put a star (*) next to those they use themselves. Tally the responses in class and discuss.

a. Which appliances seem to be in everyone's home?

b. Which of the checked items are the most essential? Is it possible to agree?

c. Would everyone in the world give the same responses on the checklist?

d. Why do Americans consume as much electrical energy as they do?

e. If you were asked to reduce the amount of electricity you consumed, which items would you be most willing to give up?

f. Who should decide which items you will give up?

1.6, 2.4 Conduct experiments related to household uses of energy and appliances, lighting, etc. Use copies of masters from Packet "A" - Grade 4 (Learning Stations) for directions for groups of students. These experiments are taken from Energy Conservation - Experiments You Can Do..., Thomas A. Edison Foundation, Inc., 1974.

Use of Energy in Leisure Time

1.7, 1.8 Prepare a data sheet (*Data Sheet #4*) on vacations for the past three years--amount of travel involved, etc. Plan, with parents, a new kind of vacation. Suggest that instead of driving from one motel to another to find one place to spend the whole vacation. Use ideas that include tennis courts, backpacking, swimming, nature walks, and other energy-conserving activities. Include a note to parents explaining what you want them to do and asking that the data sheet be returned.

1.7, 1.8 Have the children take an imaginary trip to anywhere they want to go. They should be ready to tell the class whether anyone will be going with them, what would be needed in order to take the trip, how they would get there, whether many people are there, and whether it is a natural or man-made environment.

1.7, 1.8 Discuss hobbies with the class. Encourage the students to bring in their hobbies to share with the class. Also discuss hobbies they wish to have. Talk about how much energy is involved in the various hobbies and their development.

2.00 Personal Accommodation: The learner will develop a conservation ethic in regard to energy

Making Decisions, Accepting Consequences

2.1, 2.3 Ask the students to examine a weekly grocery bag at their home and bring the unnecessary packaging they find to school. Examples might include the polyshrink wrap on meat, cartons for toothpaste, plastic bags for carrots, double wrap on frozen food, etc. Write letters to the various companies explaining the need to conserve and how they can help. Have the children include suggestions for alternative packaging.

2.1, 2.2, 2.3 Credit: Energy Activities for the Classroom--1976, Herbert L. Coon and Michele Y. Alexander, ERIC Center for Science, Mathematics, and Environmental Education, Ohio State University, 1200 Chambers Road, Columbus, Ohio 43212.

In most countries of the world, food purchased in grocery stores, bakeries, and meat markets is not wrapped in polyethylene or placed on styrofoam trays and then wrapped. The shopper brings her own shopping bag to market and places the unwrapped lettuce, unbagged oranges, and other purchases directly in her shopping bag. Much of the energy used to produce plastic film, waxed paper, styrofoam trays, and other containers is saved in most countries. After discussion along the lines suggested above, ask each student to interview his mother about her willingness to use the simpler system found in most countries. What problems does she see? (*Data Sheet #5*)

Ask each student to report to the class concerning his mother's judgment on these matters.

If mothers and students believe overpackaging is present, ask the students to write a letter stating their concern to be mailed to their supermarket manager. Suggest in the letter that the class would be interested in knowing how he feels about the matter.

2.1 Situation Cards

Provide each student in your class with a copy of a score card (*Sheet #6*). Pass out the situation cards to the students. The student reads the card aloud and has two minutes to make a choice and defend the choice. You may wish to spend several days on this using a different group of students each day.

The rest of the class rates the student from 1-5 (1 for not adequate and 5 for excellent). Then the person is given one more minute to defend or change his position. The class again scores the student. (Situation Cards can be copied from Situation Cards #1 and 2, and mounted on tag board.)

2.1, 2.2, 2.3 Hand out sheets (*Master #3*) listing some things people have done to achieve desired changes. Students first check ( ) those things which they have done, then "X" those they would like to do. Students should attempt to actually do at least one of the items they have X'd.

2.1, 2.2, 2.3 Unfinished Sentences--Values Clarification Activity

The teacher provides a series of unfinished sentences (examples below) then quickly goes around the room calling on students to complete aloud any one of the sentences with whatever comes to mind. This can be done several times if interest prevails. A discussion can follow with the students elaborating on their answers or questioning other students on their answers. There are also variations which may be used.

Unfinished Sentences: (Relate answers to thoughts on energy)

1. On Saturdays, I like to...
2. If I had had another week of summer vacation, I would...
3. On Sundays I wish my family would...
4. I think my parents should...
5. The thing that scares me most about the energy shortage is...
6. Someday I am going to...
7. If I could introduce a bill into Congress, I would...
8. Twenty years from now, I hope this country...
9. When I become a father or mother, I...

Variations

1. Each student writes out all the sentences before the oral whip begins.
2. The students write out their sentences and then break into pairs or trios and discuss their finished sentences.
3. Each student completes the sentences in writing and files them away for later. At a later date do it again and they take out their sentences to see if they have changed their opinions.

Personal Value from Energy Conservation

2.2 Encourage the children to write editorials for several local newspapers on "What's Good About the Energy Crisis." Once these have been printed, the students can cut them out and post them or include them in energy scrapbooks.

2.2, 2.3 Have the children set up a display showing ways to save energy. This display should be placed in a public library, shopping mall, or other area where many people will be exposed to it.

2.2, 2.3 Encourage the children to write child-authored books on the topic of energy and conservation. These could be shared with children in other grade levels and also displayed in the library.

2.2, 2.3 Have the students learn how to read electric and gas meters. Actual electric meters are often available, on loan, from the local electric company. Students could easily make cardboard models of electric and gas meters for practice. (*Transparency #3, 4* will also help.)

After the students have mastered how to read the meters, ask each student to read the gas and/or electric meters in their homes at an agreed upon time. (*Data Sheet #7*) They will also be reading the meters exactly one week later to determine how much gas and electricity they use in one week. The data they collect should be recorded on a classroom chart. (*Chart #1*)

Once the above has been done, announce an "energy saving week." Students are to encourage their families to see how much they can reduce the amount of gas and/or electricity they use before the next weekly reading. Record the data for the second week (Same *Data Sheet*).

a. Which family saved the most? The least?

b. What was the average saving?

c. Was it hard or easy to save energy? Students from the families that saved the most could explain how they were successful.

Energy Conservation in School and Community

2.3 Students prepare a program and displays about energy and energy conservation to show parents at open house or at a PTA meeting.

2.3 Have the students participate in an activity where they see which group can prevent an ice cube from melting for the longest time possible. Discuss and display materials that could be used. Divide the class into groups and have the groups propose a plan to preserve the ice cubes, then proceed with the activity. (*Data Sheet #8*)

2.3 Action Projects--Values Clarification Activity

If there is a need, students can take action to help, individually or, if there is a consensus, collectively. As they go into action they become clearer about what their values are. The teacher should encourage students to see that they have power, permit them to select or reflect any action project, and do not insist that every student participate in every action project. All action should be informed action so reading, learning, discussing are necessary first steps. The class can suggest ideas for projects throughout the study of energy.

Life-Styles and Energy

2.4 Students interview other people to find out what the "good life" is. Interviews should include adults and fellow students. These interviews could be taped and then discussed by the class.

2.4, 2.5 Send copies of *Master #4* home with the students. This should help to initiate a family discussion about energy and energy conservation. Encourage the students to share ideas with the class from their family discussions.

2.4 Supply each child with a copy of *Master #5*. This activity would serve as a quick check on the understanding each student has about energy conservation.

Implications for Energy Conservation

2.5 Credit: Energy Conservation: Experiments You Can Do..., Thomas A. Edison Foundation, Inc., 1974.

By now, students have heard the energy-saving hint that asks the public to take showers instead of baths. In this experiment, students can see for themselves that more energy is used in bathing. Students can do this activity as a homework assignment and share the results in class. (*Data Sheet #9*) Generally, it takes an ounce of oil or a cubic foot of gas, or 1/4 kilowatt-hour of electricity to heat a gallon of water. Ask students to determine how much oil, gas, or electricity it took to heat their bath and shower water.

Energy Activities
Grade 4
Packet "B"
Data Sheet #1
1.1, 2.1, 2.4

OUR FAMILY CONSERVES

What can each member of your "family" do to use less natural gas and fuel oil this winter?

Father?

Mother?

Children?

Energy Activities
Grade 4
Packet "B"
Master #1
1.1

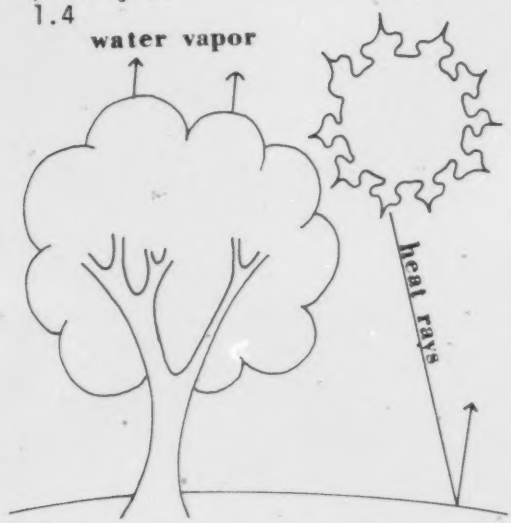
OUR ENERGY NEEDS

You will find below, the beginning of a list of energy users. Please add to this list. Think about each item and place an "x" in the column under the form of energy that powers the user. Some of the users run on more than one type of energy.

Energy User	Electricity	Coal	Natural Gas	Oil	Battery	Sun
clock	X				X	
green plant						
television						
stove						
furnace						
radio						
flashlight						
lamp						
refrigerator						

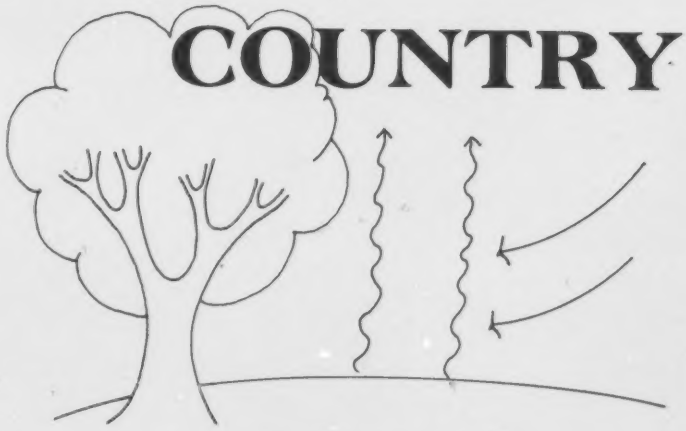
Energy Activities
Grade 4
Packet "B"
Transparency #1
1.4

MAN AND HIS CITIES

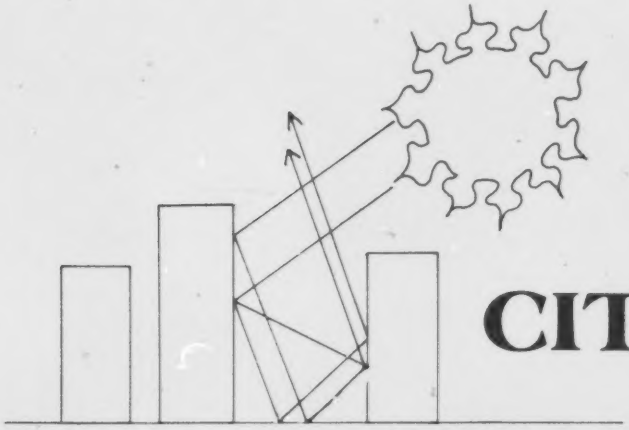


Most energy from sun is used in the evaporation of water.

COUNTRY

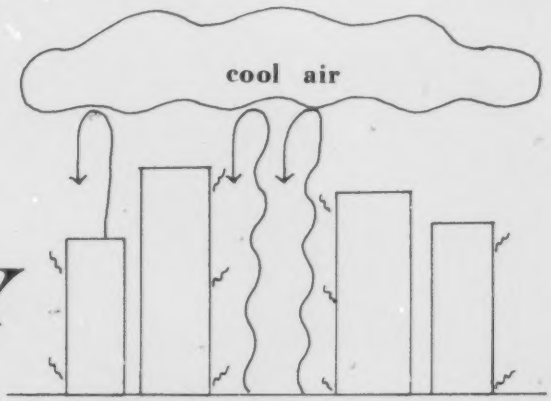


Heat in ground rises rapidly at night and cool air replaces it.

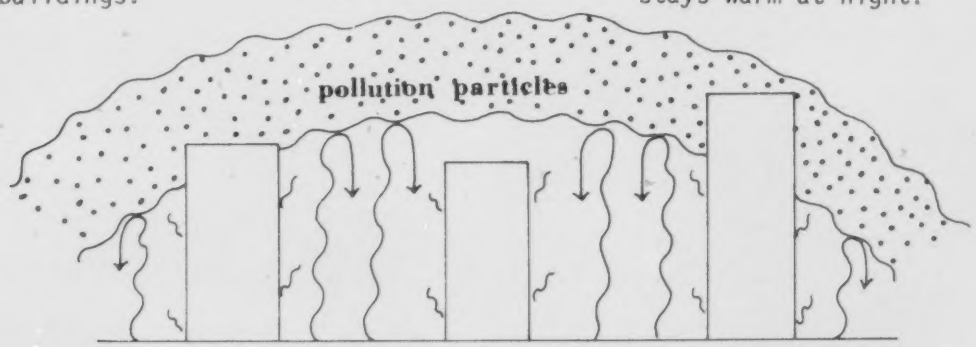


CITY

Sun's heat is captured and held by building surfaces.
Air is heated by the warmed surfaces of the buildings.



Rooftops and streets cool quickly and this forms a blanket of cool air which traps warm air. City stays warm at night.



Cars, furnaces, factories, buses add heat and pollution to the cities. The pollution particles block the rising heat and keep it from moving out of the city.

Energy Activities
Grade 4
Packet "B"
Survey Sheet #2
1.5, 1.6

TRAFFIC SURVEY

Name _____

Date _____

Type of Vehicle	How Many?
Car	
Truck	
Bus	
Van	
Pick-up	
Motorcycle	
Bicycle	

Energy Activities
Grade 4
Packet "B"
Survey Sheet #3
1.5, 1.6

SCHOOL SURVEY OF BIKE AND CAR USERS

Grade Level: _____

Student's Name	Bike	Car	Walk	Why Doesn't Ride Bike More Often?
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

EXPERIMENT IN ENERGY AND LIFESTYLE

	Slow Driver	Fast Driver
Distance covered	1000 miles	1000 miles
Elapsed time	20 hr., 43 min.	20 hr., 12 min.
He passed	645 cars	2004 cars
He was passed by	142 cars	13 cars
He used brakes	652 times	1339 times

Energy Activities
Grade 4
Packet "B"
Master #2
1.6, 1.8, 2.4

HOW I USE ELECTRICITY IN MY HOME

Listed below are many electrical appliances used in American homes every day. Check each item you have in your home. If you use (operate) the item yourself, use a double check. If you think of other items you or your family use, add them to the list.

___ air conditioner
___ food blender
___ dehumidifier
___ humidifier
___ dishwasher
___ door bell
___ back massager
___ electric blanket
___ can opener
___ clock
___ coffee maker
___ slide viewer
___ shoe polisher
___ electric circular saw
___ drill sander
___ electric tooth-brush
___ washing machine
___ electric mixer
___ hair dryer
___ hair curler
___ clothes dryer
___ electric fan
___ space heater
___ lamps
___ musical instruments
___ refrigerator
___ tank filter (aquarium)
___ hedge cutter
___ electric typewriter
___ iron
___ vacuum cleaner
___ radio
___ television
___ warming tray
___ bun warmer
___ floor polisher
___ record player
___ electric knife
___ orange squeezer
___ pencil sharpener
___ electric stove
___ waffle iron
___ toaster
___ sandwich grill
___ griddle
___ frying pan
___ electric oven
___ electric shaver
___ rug shampooer
___ slide projector
___ home movie projector
___ tape recorder
___ garage door opener
___ water softener
___ snowblower (elec.)
___ mower (elec.)

Energy Activities
Grade 4
Packet "B"
Data Sheet #4
1.7, 1.8

WHERE DID WE GO?

Name _____

With the help of your parents tell where you went on vacations for the past 3 years. Include the amount of travel involved. On the back side plan a new kind of vacation.

	Where we went	Miles	Days
Year _____			
Year _____			
Year _____			

Energy Activities
Grade 4
Packet "B"
Data Sheet #5
2.1, 2.2, 2.3

INTERVIEW MOM

Name _____

Ask your mother the following questions as if you were interviewing her. Write her responses on this paper and return it to school.

1. Would you be willing to use a simpler system at the grocery store, more like the one found in many countries?

2. What problems do you see?

3. Do you think our present system should be kept?

4. Are you concerned about the amount of packaging material you now throw away?

5. Do you think the simpler system would save energy and money?

Energy Activities
Grade 4
Packet "B"
Data Sheet #6
2.1

SCORE CARD

Name	2 minute score	1 minute score	Total score

DINNER?

Situation Card #1 Energy Activities, Grade 4, Packet "B"

It is a hot summer day and Mom asks for suggestions for dinner. Would you:

A. Pile in the car and drive to a drive-in restaurant.
B. Tell Mom you want roast, potatoes, bread.
C. Start the charcoal in the outdoors grill for hamburgers.
D. Eat a cold salad.
E. Other...

CAMP IN THE DARK?

Situation Card #2 Energy Activities, Grade 4, Packet "B"

You go camping with your family one weekend. In the evening, you would like to read a book before going to bed. Would you:

A. Use the campfire for reading.
B. Use a flashlight in your tent.
C. Forget about reading and sing songs with your family around the fire.
D. Go to bed.
E. Other...

SHOWER OR BATH?

Situation Card #3 Energy Activities, Grade 4, Packet "B"

Mom wants you to wash up every day, but she warns you not to be wasteful! Would you:

A. Insist on hot showers all the time.
B. Learn to get clean in cool showers.
C. Learn to take showers instead of baths.
D. Take a quick bath each day.
E. Other...

HOW DO I GET THERE?

Situation Card #4 Energy Activities, Grade 4, Packet "B"

You live two miles from school and your parents have left it up to you to decide the best way to get to school each day. Would you:

A. Start out early and walk.
B. Ask Mom or Dad to take you in the car.
C. Ride a bus.
D. Ride your bicycle.
E. Other...

BRRR!!

Situation Card #5 Energy Activities, Grade 4, Packet "B"

It is very cold outside, the house doesn't feel too warm, and your sister is not feeling well. Would you:

A. Turn up the thermostat so she doesn't catch a chill.
B. Put warm clothes and a blanket on her.
C. Start a fire in the fireplace.
D. Other...

CHILLS

Situation Card #6 Energy Activities, Grade 4, Packet "B"

On the first cold winter day you feel a draft coming through the windows. Would you:

A. Ask Dad to caulk the windows.
B. Help Dad put on storm windows.
C. Turn up the thermostat.
D. Close the curtains.
E. Other...

SURPRISE

Situation Card #7 Energy Activities, Grade 4, Packet "B"

Dad surprises Mom with a clothes dryer on her birthday. Mom is so excited she says she will never have to hang clothes on the line again! Would you:

A. Tell Mom to hang clothes outside when it is nice.
B. Let her use the dryer all the time.
C. Let her dry small loads whenever she wants to.
D. Other...

COOL IT!

Situation Card #8 Energy Activities, Grade 4, Packet "B"

On a hot summer day you want to get cooled off. Would you:

A. Turn on the air conditioner.
B. Turn on the fan.
C. Jump in the heated pool.
D. Fan yourself with a stiff piece of paper.
E. Other...

Energy Activities
Grade 4
Packet "B"
Master #3
2.1, 2.2, 2.3

MY ACTION WORKSHEET

(✓) those things you have done

(x) those things you would like to try

Write a Letter

___ 1. Write a letter to the editor of your local newspaper. You can influence public opinion.
___ 2. Write a letter to your Congressmen or your Senators. Compliment them for something they may have done about a problem dealing with energy. They are influenced by the mail from home.
___ 3. Send a letter to someone in the news who has done something you respect or admire.

Attend a Meeting or Organize One

___ 1. Write one of the organizations working for a cause you believe in and ask to be put on the mailing list.
___ 2. Ask one of the clubs to which you belong (Boy Scouts, Girl Scouts, etc.) to invite a guest speaker on energy.

Take Part in Some Action

___ 1. You can distribute leaflets from door to door.
___ 2. Organize a petition drive. Even 20 signatures could make news.
___ 3. Interview people who are in a position to influence others.
___ 4. Wear a button.

Facts to Face Acts

___ 1. Speak up for your point of view.
___ 2. Try to close the gap between what you say and what you do.

Energy Activities
Grade 4
Packet "B"
Transparency #3
2.2, 2.3

READING AN ELECTRIC METER

READING = 13488

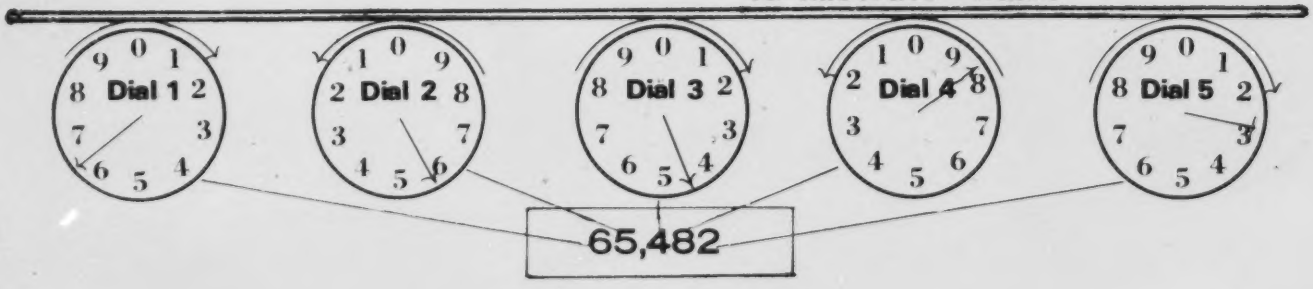
READING = 35721

READING = 66190

Monday morning meter reads 13478

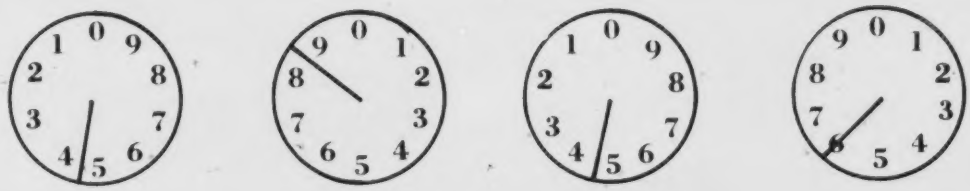
Tuesday morning meter reads 13488

How much has home consumed? 13488
-13478
10 kilowatt - hours



Energy Activities
Grade 4
Packet "B"
Transparency #4
2.2, 2.3

READING A GAS METER



READING = 4846

Sunday meter reading is 4786

Next Sunday meter reading is 4846

How much has home consumed?

4846
-4786

60 'units' of gas

Each 'unit' = 100 cubic-feet of gas

60 × 100 = 6,000 cubic-feet of gas

Energy Activities
Grade 4
Packet "B"
Data Sheet #7
2.2, 2.3

HOW MUCH GAS OR ELECTRICITY DO WE USE?

Name _____

Date _____ **Time** _____ **READING** _____

Date _____ **Time** _____ **READING** _____

TRY TO SAVE ENERGY!

Date _____ **Time** _____ **READING** _____

Date _____ **Time** _____ **READING** _____

Date _____
Time _____

READING _____

Date _____
Time _____

READING _____

TRY TO SAVE ENERGY!

Date _____
Time _____

READING _____

Date _____
Time _____

READING _____

Energy Activities
Grade 4
Packet "B"
Chart #1
2.2, 2.3

AMOUNT OF ENERGY WE USE

Family	Kilowatt-hours of Electricity	Cubic-feet of Gas	Kilowatt-hours of Electricity	Cubic-feet of Gas

Energy Activities
Grade 4
Packet "B"
Data Sheet #8
2.3

PRESERVING AN ICE CUBE

Group's plan to prevent the ice cubes from melting so quickly _____

_____

_____

Time

Start ___ Which material worked best?

Stop ___

Group's plan to prevent the ice cubes from melting so quickly _____

_____

_____

Time

Start ____ Which material worked best?

Stop ____

Energy Activities
Grade 4
Packet "B"
Master #4
2.4, 2.5

Dear Parents,

Your child is currently involved in learning more about how energy affects our lives and how energy can be changed from one form to another. Energy crisis, energy shortage, higher utility bills, etc. all have increasingly become a portion of our daily living. In order that the children of today can become better able to act as responsible citizens of tomorrow, we need to act now. U. S. energy consumption doubles every 13 to 15 years. This is frightening when we realize that we depend heavily upon nonrenewable resources to supply our energy and these will not be available one day.

Please use the following questions to help you in starting a family discussion about energy. You can certainly add to the list if you feel it is necessary! I feel that once everyone becomes involved in this type of discussion, school will be more meaningful for the child, the home will be able to share in the child's experiences, and it is one way for them to feel they have influence in decision making.

Thank you!

Questions

1. How many times is a source of energy changed before we use it to heat our home? To cook?
2. Are there ways we could reduce the number of conversions before we use an energy source?
3. What energy "needs" do we have? What are our energy "wants"?
4. Why is there an energy shortage?
5. What can we do to reduce the amount of energy we use in transportation and in our home?
6. Will our life change much if we cut down on our energy use? Will the change be good for us?
7. What can we do to help others understand more about energy shortages and what we can do?

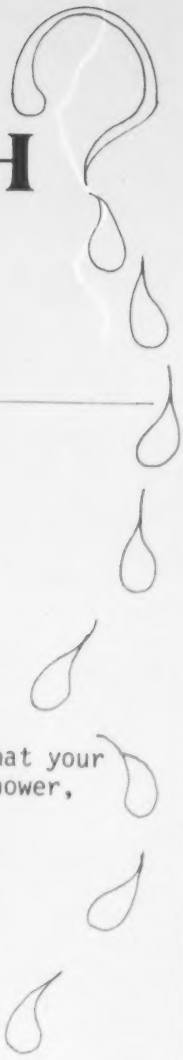
CONSERVATION QUIZ

Dripping hot water faucet	Room with thermostat set at 68° or lower	Lights on in an unoccupied room	Electric can opener	Car making a quick stop	Washing machine with cold water only
Grow a garden	Electric blanket	Doors and windows closed in cold weather	Car easing to a smooth stop	TV off when no one watching	Car pool
Public building too hot or too cold	Fluorescent lights	Outside lights burning during the day	Lamps with more than 70 watt bulbs	Car with only one passenger	Take showers instead of baths
Car coming to a quick stop	Wear sweaters and warm clothing in cold weather	Bicycle instead of using car	Electric toothbrush in use	People walking to work or school	Car speeding over 55 mph
Sun allowed to shine into home to give warmth	Color TV	Door or window open with heat or air conditioning on	Full loads in the washing machine	Room with thermostat above 68°	Conserve paper
Car idling with no driver	Lights off when no one using them	Electric knife in use	House with no storm windows	Clothes hanging out to dry	Rycycling of paper, glass, metal

Directions

1. Mark each block with an x when you actually find what is described.
2. Color the blocks red which show a waste of energy.
3. Color the blocks yellow which show saving of energy.

SHOWER OR BATH



Fill the bathtub as usual.

Before bathing, measure the depth of the water in inches.

Bath water _____ inches

Take a shower.

Before you begin the shower, close the bathtub drain so that your shower water will collect in the tub. After taking the shower, measure the depth of water collected in the tub.

Shower water _____ inches

Which used less hot water?

By how much?

ANNOTATED CHILDREN'S BIBLIOGRAPHY
Grade 4-6

BOOKS AND PAMPHLETS

Adler, Irving
Atomic Energy
John Day Company, 1971, 47pp., $3.69

Explains why atomic energy may be the only answer to fuel for power in the future.

Adler, Irving and Ruth
Coal
John Day Company, 1965, 47pp., $3.96

Traces the development of coal, how it is mined, its uses, and its many by-products.

Adler, Irving
Energy
John Day Company, 1970, $3.96

Practical examples of changes from one form of energy to another.

Adler, Irving
Petroleum: Gas, Oil, and Asphalt
John Day Company: New York, 1975, 48pp., $5.95

Aimed more towards the science-oriented. It has concise coverage of the story of oil and gas. It includes definitions, formation, location, and extraction of petroleum.

Barr, Donald
How and Why Wonder Book of Atomic Energy
Grosset & Dunlap: New York, 1961, 48pp., $1.50

Tells the development of the atomic bomb. It also describes the steps taken to learn how to use controlled atomic energy for power.

Benrey, Ronald M.
Nuclear Experiments You Can Do
Thomas A. Edison Foundation, Inc.: Michigan, 1976

Booklet containing some basic facts about nuclear energy and related experiments. Designed to aid in the understanding of nuclear energy.

Energy Reprints from ERDA
Solar Energy

A folder of solar reprints from a variety of sources that provide ideas of what can be done to apply solar energy for use in the home.

Faber, Doris
Enrico Fermi: Atomic Power
Prentice Hall, 1966

Freeman, Mae & Ira
The Story of Electricity
Random House, 1961

Haber, Heinz
The Walt Disney Story of Our Friend the Atom
Simon and Schuster: New York, 1956, 165pp.

Explanation of atomic energy provided in a combination of story and fact.

Halacy, D.S., Jr.
The Energy Trap
Four Winds Press: New York, 1975, $6.95

Describes the energy crisis, its link to the gross national product, and alternatives for current and future fuel resources.

Halacy, Daniel Stephen
Experiments With Solar Energy
W.W. Norton and Company, Inc., 1969, $4.50

Selection of materials, approximate cost, the construction and operation of devices using solar energy.

Harrison, George Russell
The First Book of Energy
Franklin Watts, Inc.: New York, 1965, 77pp.

Words and illustrations explain what energy is, kinds of energy, how energy affects the economy of the world, and what mankind could do with more energy.

Hinkelbein, Albert
Energy and Power
Watts, 1971

Historical approach to energy. Various sources of energy are described. It suggests new ways of using energy and speculates on future supplies.

Iowa Energy Policy Council
Home Energy Conservation

Booklet filled with useful information to help consumers conserve energy.

Iowa Power
"Answers to Forty of the Most Commonly Asked Questions About Electricity"

Small pamphlet available from Iowa Power which states each question and then relates answers which are simply stated and easily understood.

Iowa Power
Be Energy Wise - It All Adds Up!

Booklet designed to help citizens review constructive and up-to-date ideas on how to conserve energy in the home.

Iowa Power
Dr. Wise Use Energy Diet

Booklet available to the public which contains the cost to run every appliance in a home, and some ideas to help consumers cut down energy use.

Irving, Robert
Energy and Power
Alfred A. Knopf: New York, 1958, 140pp.

Describes work, power of different types, sources of energy other than fuels, and energy of the future.

Kelman, Peter and A. Harris Stone
Ernest Rutherford: Architect of the Atom
Prentice Hall, 1969

Kiefer, Irene
Underground Furnaces: The Story of Geothermal Energy
William Morrow and Company, Inc.: New Jersey, $4.95

Easy but accurate explanations of how four kinds of "hot spots" are formed and how they can be transformed into usable energy.

Knight, David C.
Harnessing the Sun: The Story of Solar Energy
William Morrow and Company: New York, 1976, $5.95

Tells of past and present work in the field of solar energy and speculations on what may lie ahead.

Marshall, James
Going, Going, Gone?
Coward, McCann and Geoghegan, Inc.: New York, 1976, $5.49

Consideration is given to the waste of energy resources by Americans. Tells us how and why we allow waste to continue.

Mattison, C.W.
Man and His Resources in Today's World
Creative Educational Society: Mankato, Minnesota, 1967, 150pp., $6.95

Book on man's resources which is well illustrated. It emphasizes conservation and touches on pollution. Also includes future power resources.

Millard, Reed
Natural Resources: Will We Have Enough for Tomorrow's World?
Messner, 1972

Each chapter begins with a question relating to a specific natural resource and the possibility of their depletion. Also provides suggestions for further reading.

Moore, Jordan
Energy
Grosset & Dunlap: New York, 1967, 61pp.

Provides examples of many types or sources of energy and also experiments for a better understanding of what energy is.

National Dairy Council
How Your Body Uses Food
28pp., $.25 per copy

Graphic art, photographs, and text emcompassing easy, safe experiments with foods, challenge for growth, energy and health. The booklet can be useful in science, health, and nutritional studies.

National Wildlife Federation
The Best Present of All
National Wildlife Federation: Washington, D.C.

Comic brochure on energy for children.

Office of Conservation Education
Energy Conservation: Understanding and Activities for Young People
U.S. Government Printing Office: Washington, D.C. 20402
Stock No. 041-018-00091-7, 1975, $.85 per copy

Booklet written in language understandable for the upper elementary and junior high student. The material on energy, its uses, and conservation aids the student in his understanding. The suggested activities are interesting.

Podendorf, Illa
The True Book of Energy
Children's Press: Chicago, 1971

Book relates the importance and kinds of energy to children's own experiences. The book contains short sections and many illustrations.

Pringle, Laurence
Energy: Power for People
Macmillan Publishing Company, Inc.: New York, 1975, $6.95

Author urges young people to face the facts about the energy supplies of the earth.

TCI Advertising, Inc.
The Atom and the Energy Crunch
Reddy Communications, Inc., 1976

Available from Iowa Power. Booklet containing information on the energy crisis; what has caused it, nuclear energy, future energy sources.

TCI Advertising, Inc.
Coal and the Energy Crunch
Reddy Communications, Inc., 1976

Available from Iowa Power. Information on sources of coal, value as an energy source, problems due to use of coal, and the importance of planning ahead.

TCI Advertising, Inc.
Electric Utilities and the Energy Crunch
Reddy Communications, Inc., 1976

Available from Iowa Power. Information to aid in the understanding of where electricity comes from and why the supply of power is threatened.

Reuben, Gabriel H. and Joseph Di Stefano
What Is An Atom?
Benefic Press, 1960

Ross, Frank
The World of Power and Energy
Lothrop, Lee and Shepard, 1967, $4.32

Sun, sky, water, earth, fossil fuels, chemical and atomic energy. The book also concerns itself with energy from the depths of the earth.

Ruchlis, Gyman
Thank You, Mr. Sun
Harvey House Publishers: New York, 1966, 45pp.

Provides many illustrations of how the sun helps mankind and nature.

Shuttlesworth, Dorothy E. and Lee Ann Williams
Disappearing Energy
Doubleday and Company, Inc.: New York, 1974, 96pp., $5.95

Good resource book which presents factual data on the use and misuse of energy. Also reviews what has been done in regards to conservation but does not look into the possible future solutions.

Smith, Norman F.
Sun Power
Coward, McCann and Geoghegan, Inc.: New York, 1976, 46pp., $4.64

Everything that lives and grows on the earth uses energy from the sun. Gives a new understanding and appreciation of the sun, our chief energy source.

Syrocki, Ed.D.
What Is Electricity?
Benefic Press, 1960

Szulc, Tad
The Energy Crisis
Franklin Watts, Inc.: New York, 1974, 128pp., $6.95

Author reveals many disturbing items in relation to the energy crisis and why it is here. It also contains an explanation of why the energy crisis will continue into the future.

Thomas A. Edison Foundation, Inc.
Energy Conservation: Experiments You Can Do
Michigan, 1974, 32pp.

Booklet containing many energy conservation experiments designed to bring about a better understanding of how energy can be conserved at the present time.

Wohlrabe, Raymond A.
Exploring Solar Energy
The World Publishing Company, 1966, 89pp.

Identifies early history of sun worshipers, how the sun provides heat and light which can be turned into electricity. It also discusses the uses of solar energy for the future.

Zim, Herbert
Waves
Morrow, 1967, $3.78

Brief useful introduction of tidal waves and underwater earthquakes.

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BOOKS AND PAMPHLETS

Asimov, Isaac
Electricity and Man
U.S. Atomic Energy Commission
U.S. Government Printing Office, 1974

An informative booklet intended to aid citizens in understanding the vital force of nuclear energy. This and other information booklets, are available for the general public. School and public libraries may obtain a complete set without charge. Available from: USAEC - Technical Information Center, P.O. Box 62, Oak Ridge, Tennessee 37830.

Asimov, Isaac
Worlds Within Worlds: The Story of Nuclear Energy, Vol. 1, 2, 3
U.S. Energy Research and Development Administration

Three comprehensive booklets including atoms, electricity, and energy showing how man has learned to produce and control nuclear energy.

Cottrell, Frederick W.
Energy and Society: The Relation Between Energy, Social Change, and Economic Development
McGraw, 1955, 330pp., $15.00

Survey which examines the use of energy in low and high energy societies.

Daniels, Farington
Direct Use of the Sun's Energy
Ballantine Books: New York, 1974, 271pp., $1.95

Provides a review of the potential of solar energy and urges additional research. Fun and informative books which could also spark projects and solar experiments.

Energy Research and Development Administration
Creating Energy Choices for the Future
Office of Public Affairs: Washington, D.C. 20545, 1975

A booklet designed to improve the understanding of the U.S. energy policy.

Federal Energy Administration
Organizing School Energy Contests
Washington, D.C. 20461

Helpful brochure encouraging the formation of school energy contests. Guidelines are given as to the processes involved.

Federal Energy Administration
Tips for Energy Savers
Washington, D.C. 20461

Helpful booklet filled with many useful and simple ways to save energy. Designed for individuals and families, but also contains a teaching guide for teachers to help students bring these tips to the concern of the family.

(Ford Foundation Energy Policy Project)
A Time to Choose: America's Energy Future
Ballinger: Massachusetts, 1974, 511pp., $12.95

Final report of a three-year, $4 million study. Reflects the conviction that America can and should have a national energy policy that serves the needs of all people.

Fowler, John W.
Energy - Environment Source Book
National Science Teachers Association, 1975

Designed for teachers who wish to incorporate a study of energy into their teaching. It is divided into two volumes, each with many charts, tables, figures.

Fritsch, Albert J. and others
Energy and Food: Energy Used in Production, Processing, Delivery, and Marketing of Selected Food Items
Center for Science in the Public Interest, 1975, 80pp.

The authors suggest ways to reduce the input of energy in food processing.

Hammond, Allen L., William D. Metz and Thomas H. Maugh II
Energy and the Future
American Association for the Advancement of Science: Washington, D.C., 1973, 184pp., $3.95

Gives an introduction to each of the present and possible future energy sources. It also covers energy conservation and energy policy.

Halacy, D.S., Jr.
Wind, Sun, and Water: Our Energy Alternatives
Harper, 1977, 192pp., $9.95

Easily read. The renewable resources of geothermal, water, tidal, sea thermal energy, wind, biofuels, and solar energy are presented for consideration.

Hayes, Dennis
Energy: The Case for Conservation
Worldwatch Paper, 1976, 77pp.

Review of the economics of energy expenditures and contains many good charts and graphs.

Hodges, Laurent and John Neff
Solar Energy: 1976
Report from the Iowa Energy Policy Council, June, 1976

Descriptive report of some uses to which solar energy is being put and anticipation for further uses.

Iowa State Department of Public Instruction
Energy Conservation in School Facilities

Brochure designed to encourage energy conservation in school facilities. Specific recommendations for reducing energy waste are proposed.

Lapp, Ralph E.
The Nuclear Controversy
Fact Systems: Connecticut, 1974, 93pp.

Especially interesting to foes of nuclear fission.

Lemish, Dr. John
Mineral Deposits of Iowa
Iowa Southern Utilities Company
Craftsman Press, Inc.: Burlington, April, 1969

Excellent resource for Iowa teachers as it is a statement of the mineral deposits and their potentials in the state of Iowa. Some of the information can be condensed and revised for use with upper elementary students.

Miller, Roger LeRoy
The Economics of Energy: What Went Wrong?
Morrow, 1974, 131pp., $4.95

Short review which includes criticism of living the simple life and price controls.

Olin, Dr. Hubert L.
Coal Mining in Iowa
State Mining Board
State of Iowa: Des Moines, Iowa, 1965

Booklet which presents the early history of coal mining in Iowa, its importance as a resource of the state, and its role in the development of Iowa's economy.

Rocks, Lawrence and Richard P. Runyon
The Energy Crisis
Crown: New York, 1972, 189pp., $2.95

Review of sources of energy, impending crisis, resolutions for the problems the U.S. is presently facing.

Simmons, Henry
The Economics of America's Energy Future
U.S. Energy Research and Development Administration, Office of Public Affairs: Washington, D.C. 20545, 1975

Booklet which reviews the role of energy in American life, trends in energy supply, and highlights various forms of energy.

Steinhart, Carol and John Steinhart
The Fires of Culture: Energy Yesterday and Tomorrow
Duxbury, 1974, 273pp., $4.95

A general introduction to energy. Contains material on energy policy, energy and food.

Stolp, Richard N. and Frederick P. Deluca
Perspectives on Iowa Coal
Energy and Mineral Resources Research Institute, Iowa State University: Ames, Iowa 50011, 1976

Colorful and easily understood report on the Iowa Coal Research Project which provides information for interested Iowans.

Swatek, Paul
The User's Guide to the Protection of the Environment
Friends of the Earth, 1970, 305pp.

Paperback which provides specific information on daily decisions which could improve or deteriorate a person's environment. Packaging products, cleansers, energy consumption in the home, are examples of topics the book covers.

Tuthill, Dr. Samuel and Maurice Van Nostrand
Our Energy Needs: Questions and Answers
1973

Very helpful material regarding an energy shortage in the U.S., related in concise form. Helpful to Iowa teachers at all levels.

Udall, Steward and others
The Energy Balloon
McGraw, 1974, 288pp., $7.95

Author urges development of new attitudes and leaner life-styles in order that there will not be as much wastefulness.

U.S. Department of Commerce
Energy: Critical Choices Ahead
Office of Energy Programs, May, 1975

Brochure designed to put the energy problem into perspective and to give indications of the efforts required to meet energy needs.

U.S. Environmental Protection Agency
Questions and Answers About Nuclear Power Plants
U.S. Environmental Protection Agency: Washington, D.C., Revised, 1973

Pamphlet designed to answer many questions which have arisen concerning nuclear power plants and the environment.

ANNOTATED TEACHER'S BIBLIOGRAPHY

CURRICULUM GUIDES AND RESOURCE BOOKS

American Gas Association, Education Services, 1515 Wilson Boulevard, Arlington, Virginia 22209

Provides many booklets, pamphlets, kits, filmstrip on natural gas. Specifically for grade 5 you may be interested in "Natural Gas Serves Our Community Kit"--N00160 and "Flames and Energy"--N81070.

A Teacher's Introduction to Energy and Energy Conservation
Ohio Department of Education, 1975
Battelle Center for Improved Education, 505 King Avenue, Columbus, Ohio 43201 (ED 127 160)

Guidelines on energy and energy conservation. Provides teacher orientation to energy education and general suggestions for teaching units.

CEL Blocks
Primary Interdisciplinary Environmental Learning Packets, Brevard County, Florida (ESEA Title III, Project #050-2323-73003)

Student cards covering areas of environmental education which can be used by teachers in a variety of interdisciplinary ways.

Energy
Environmental Education Project, ESEA Title III, Section 306
Topeka Public and Parochial Schools, 1601 Van Buren, Topeka, Kansas 66612 (ED 093 649)

Objectives are listed, along with activities which meet the stated objectives. Teachers select only those appropriate to the objectives for their students.

Energy
Michigan United Conservation Clubs, P.O. Box 30235, Lansing, Michigan 48909

Provides information on the nature of energy, sources and uses of energy, and conservation. There are also some work sheets and ideas for helping others learn more about energy.

Energy
Social Issues Resource Series, Eleanor C. Goldstein, c. 1975.
Social Issues Resource Series, Inc., 1200 Quince Orchard Boulevard, Gaithersburg, Maryland 20760

Notebook filled with reprints of articles related to energy.

The Energy Challenge
Federal Energy Administration
The Energy Challenge, Box 14306, Dayton, Ohio 45414

Twenty-five spirit duplicating activity masters designed for grades 5 through 8. Also contains a teacher's guide section.

Energy Conservation Classroom Kits 1-3, 4-6
Southern California Edison Company, c. 1976
Educational Services, Room 397, P.O. Box 800, Rosemead, California 91770

Colorful kits to help teachers teach about energy conservation. There are folders, inspector cards, stickers, certificates. The teacher's guide contains ideas and lesson plans, in addition to duplicating masters.

The Energy Crisis: What You Can Do About It
Standard Oil Company (Indiana), c. 1973
Mail Code 3705, 200 E. Randolph Drive, Chicago, Illinois 60601

Folder containing four spirit masters and specific teaching instructions. The spirit masters give information and ask for students to supply some interpretation. Parents and other adults are encouraged to participate.

Energy Crisis Teaching Resources
Curry, Wendell, et. al., Oregon State Board of Education, Salem, Oregon, 1973, 59 pp. (ED 085 316)

Many very useful activities to be used in stressing individual responsibility towards energy crisis problems.

Energy - Environment Materials Guide
Kathryn E. Mervine and Rebecca E. Cawley
National Science Teachers Association, Washington, D.C., 1975
(ED 111 663)

Handy source book containing annotated bibliographies for teachers, students, non-print material.

Energy - Environment Mini-Unit Guide
Smith, Stephen M., Editor, c. 1975
National Science Teachers Association, Washington, D.C. (ED 111 664)

Materials designed to stimulate decision making in young children and to make teaching more interdisciplinary. It is filled with many activities and guidelines.

Energy for Today and Tomorrow
San Diego City/County Schools Energy Education Committee
Department of Education, San Diego County, 6401 Linda Vista Road, San Diego, California 92111, 1975

Activities for students in grades kindergarten through six. These help to create an awareness of the need of dealing with energy problems.

Energy and Man's Environment
Jones, John, D.Ed., Editor, 1976
Energy and Man's Environment, Inc., 0224 S.W. Hamilton, Suite 301, Portland, Oregon 97201

Interdisciplinary teacher's guides to energy and environmental activities. Involves 8 books - Activity Guide, Uses of Energy, Sources of Energy, Impacts of Energy, Limits of Energy, Conversion of Energy, Future Sources of Energy, Glossary.

Energy and Man's Environment - Activity Guide
Ris, Thomas F.
Energy and Man's Environment, 2121 Fifth Avenue, Seattle, Washington 98121 (ED 106 070)

Provides educational strategies and materials needed for introducing energy to all grade levels on an interdisciplinary basis. Each chapter has four themes: (1) Scientific, (2) Ethical, (3) Aesthetic, (4) Utilitarian.

Energy Activities for the Classroom - 1976
Coon, Herbert L. and Michele Y. Alexander, 1976
ERIC Center for Science, Mathematics, and Environmental Education College of Education, The Ohio State University, 1200 Chambers Road, Third Floor, Columbus, Ohio 43212

Resource booklet of energy teaching activities divided into grade levels: K-3, 4-6, 7-9, 10-12.

Environmental Education: Strategies for Wise Use of Energy
Division of Science Education, North Carolina Department of Public Instruction, Raleigh, North Carolina 27611, c. 1974

Designed for use at all grade levels, therefore, activities are grouped K-3, 4-6, 7-12. An appendix contains charts, glossary, bibliography, checklists.

Fun With the Environment
Environmental Protection Agency
Washington, D.C., 1973, 20pp. (ED 103 213)

Activity booklet which helps young children learn about their environment. The booklet has a cartoon and coloring book format.

Heirarchy Chart
John Muir Institute for Environmental Studies, Inc., 2118-C Vine Street, Berkeley, California 94709

Comprehensive total concept chart which was to be used in developing environmental studies curricula to supplement existing K-12 programs.

Living Within Our Means: Energy and Scarcity
Environmental Educational Instructional Activities K-6
The University of the State of New York, The State Education Department, Albany, New York 12234

Instructional manual which illustrates ways in which environmental concerns may be integrated into the curriculum. Excellent activities arranged according to disciplines.

"Mickey Mouse and Goofy Explore Energy"
Walt Disney Productions, 1976
Public Affairs Department, EXXON, U.S.A.
P.O. Box 2180, Houston, Texas 77001

Very comprehensive, yet delightfully presented energy comic book. Copies are available from the above address. Covers previous sources of energy and possible future sources.

My Energy is Your Energy
Arizona Department of Education, February, 1974

Resource book and conservation activities designed for K-12.

Nuclear Power - Meeting a Need a New Way
Cedar Rapids Community Schools, 346 2nd Avenue, S.W., Cedar Rapids, Iowa 52404, c. 1972

Provides good suggestions as to teaching about nuclear power.

Student Learning Activity Module "The Energy Crisis"
Hughes, Judi and Lee County Environmental Education Program
Title III ESEA, 2266 Second Street, Fort Myers, Florida

Contains lesson plans, resource materials, and a Student Teaching Module on energy. Developed to help create an awareness of the causes, and some solutions for the energy crisis the world is facing.

Teacher's Handbook of Energy
Colorado Department of Education, Denver, Colorado 80023, c. 1974
(ED 119 957)

Provides teachers with information on energy and instructional activity suggestions.

Ways to Environmental Education, Volume III
Allen, Rodney F., Ed. and Others
Florida State University, Tallahassee College of Education, Tallahassee Junior Museum, Florida, 1975, 150pp.

Ten environmental booklets in one volume. One booklet covers energy learning activities for camp and home.

Wide World of Energy Kit
Walt Disney Productions, 1976
Walt Disney Educational Media Company, 500 South Buena Vista Street, Burbank, California 91521

Kit contains cassette and color filmstrip titled, "The Search for Power and Energy;" 18 full-color study prints; Energy Game; 30 copies of the energy comic book, "Mickey Mouse and Goofy Explore Energy;" 10 energy activity cards; teacher's guide with information and additional activities.

ANNOTATED TEACHER'S BIBLIOGRAPHY

EDUCATIONAL JOURNAL ARTICLES

Asimov, Isaac
"The Fascinating Story of Fossil Fuel"
National Wildlife
Vol. 11, November 5, August-September, 1973

Colorful charts could be helpful material for teachers.

"Energy Consumers Turn into Conservationists"
Nation's Schools
93: 4: 26-28, April, 1974

Describes how the topic of energy conservation has been introduced into school curriculums. Salem, Oregon; Marshalltown, Iowa; Des Moines, Iowa; Buckingham, Pennsylvania are mentioned specifically.

Fowler, John M.
"Does the Energy Theme Belong in the Classroom?"
Today's Education
65: 88-9, March, 1976

Teachers are encouraged to put more emphasis on energy education in the schools. Suggestions are given to make it interdisciplinary and goals are stated which aim to prepare the "students of today - citizens of tomorrow" for life.

Fowler, John M.
"Energy, Education, and the 'Wolf' Criers"
Social Education
pp. 245-256, April, 1976

Examines the background to the current energy crisis and outlines some possible solutions to the problems.

Glickman, L. J.
"Teaching Guide on Energy"
American Education
11: 40, June, 1975

Reviews an informative handbook entitled Energy Crisis Teaching Resources: A Special Publication Suggesting School Activities Which Stress Individual Responsibility Towards Energy Crisis Problems which was initially written for Oregon's Energy Crisis Week (December, 1973).

Hankla, Alice Kimbler
"An Energy Conference for Little People"
Science and Children
Vol. 12, No. 7, pp. 5-7, April, 1975

Reviews a conference which was held for children ages 4 and 5 at which they learned what energy is, how it works, and devised methods of energy conservation.

Harder, Peter J.
"Activity Cards Bridge Science and Social Studies"
Science and Children
Vol. 12, No. 7, pp. 8-10, April, 1975

Utilizing photography, the author developed a series of local photos to be made into activity cards with the questions on the back. Several different approaches to using the cards were suggested.

Hawkins, M. E.
"Energy: Future Alternatives and Risks"
Science Teacher
41: 25-7, April, 1974

Review of a two-day Academy Forum on Energy sponsored by the National Academy of Sciences. The Forum took up six propositions regarding energy. Many ideas were brought before the assembly.

Johnson, W. A.
"Energy Cricis: Not Only Why But What Can We Do?"
NASSP Bulletin
58: 28-36, May, 1974

Author expresses that the reason the U.S. is a nation of energy spendthrifts is that we have been paying far too little for the energy we use. Feels that a rise in prices will provide the incentive for conservation.

Kenick, L. E.
"Energy Teaching Centers"
Science Teacher
43: 34-5, May, 1976

Author proposes setting up Energy Teaching Centers within a community for school children, parents and homeowners, and teachers. These centers would provide means for the local population to explore and encounter energy alternatives.

Kirman, J. M. and M. A. Nay
"Joint Planning for Integrating Social Studies and Science: Teaching About the Energy Crisis"
Social Education
39: 77-80, February, 1975

The authors express the hope that by encouraging the integration of social studies and science, schools will begin the process of providing an integrated curriculum.

Messer, Melanie B.
"Energy for Today and Tomorrow with Energy Eagle"
Science and Children
Vol. 14, No. 3, pp. 18-20, November/December, 1976

Delightful energy awareness activities produced by the San Diego County Department of Education for use with elementary students. Teachers are encouraged to adapt these to their own local situations.

Nesbitt, William A.
"The Energy Question: Problems and Alternatives"
Intercom
pp. 12-16, September, 1973

Proposes some ideas for teaching about the energy questions, charts, background information and data, and some suggested solutions with both the advantages and disadvantages.

Post, T. R.
"Energy Crisis: An Opportunity for Meaningful Arithmetical Excursions"
Arithmetic Teacher
22: 61-4, January, 1975

Suggests math activities which provide meaningful situations. Emphasis is to help students become sensitive to the implications a national crisis could bring.

Sartwell, J. G. and R. P. Abell
"Teacher's Guide to the Energy Crisis"
Today's Education
64: 90-7, January, 1975

Authors present facts about energy use, questions for students and teachers, alternative sources of energy, ideas for classroom use, and resources which are available.

Sommerkamp, P.
"Energy Crisis Gameboard"
Science Teacher
42: 39-40, June, 1975

Describes a game devised by students in Kentucky as a result of their study of energy. There are two versions - one without cards and one with cards.

"Starting Points - Energy: Plugging into the Fuel Crisis"
Learning
Vol. 2, No. 4, December, 1973

Aimed at teachers of K-8. Contains a series of activities to help students understand what energy is, as it flows through our life.

Yant, S. L.
"Facing the Energy Crisis in a Mathematics Classroom"
Arithmetic Teacher
23: 223-4, March, 1976

Teacher relates specifics of an eight-day project within a math class that created practical applications to the energy crisis.

MULTI-MEDIA MATERIALS

"The American Dream is Running Out of Fuel"
18 minutes, color, $230 or $19-rent (Gr. 5-8)
Films, Inc.
1144 Wilmette Avenue
Wilmette, Illinois 60091

"Bate's Car: Sweet as a Nut"
16 minutes, 16mm, color, $230 or $30-rent, 1975 (Gr. 5-12)
Arthur Mokin Productions
17 W. 60th Street
New York, New York 10023

Presents the inventor's energy-saving inventions, particularly his methane-driven automobile. Highly recommended by AAAS.

"Coalmining: The Story of Buried Sunlight"

Filmstrip, elementary

Ecology Activity Cards
BFA Educational Media
2211 Michigan Avenue
Santa Monica, California 90404

Some of the activities related specifically to energy. Others in the box guide the children towards conservation and the idea of using our resources wisely.

Ecology: Understanding the Crisis
Series No. 6454, c. 1972
Encyclopaedia Britannica Educational Corporation
425 North Michigan Avenue
Chicago, Illinois 60611

Filmstrip, records, guides. General coverage of what has caused the crisis, how man relates to his environment, a look into the future.

"The Economics of the Energy Problem"
Economic Topic Series
Teaching Resource Films, 1976

Sound filmstrip. Provides a basic overview of the energy problem.

"Electricity"
Community Series: Systems in Our City

Elementary level filmstrip.

"Electricity from Heat and Sunlight"
8mm film loop, color, with teacher's guide, $23.50 (Gr. 4-12)
Doubleday Multimedia

Shows how electricity can be produced from heat and sunlight.

"Energy"
Iowa Petroleum Committee

"Energy: A First Film"
8 minutes, sound, color (Gr. K-3)
BFA Educational Media
2211 Michigan Avenue
Santa Monica, California 90404

"Energy: Ability to Do Work"
9 minutes, color, sound (Gr. 5-8)
AIMS Instructional Media Service
P.O. Box 1010
Hollywood, California 90028

"Energy and Power - A First Look"
10 minutes, 16mm, 1962 (Primary - Intermediate)
Journal Films

Outlines, from the days of the caveman to the present, many ways in which man harnesses energy and increases his capacity to do work by utilizing the potential energy found in wood, wind, and running water.

"The Energy Challenge" - Kit, c. 1975
Pollution Control Education Center
Township of Union Public Schools
Union, New Jersey

Grade level undesignated, however, could be used in Gr. 6 with some modification and for the junior high. Contains student booklets, teacher's guide, two filmstrips with cassette, duplicating masters, activity cards, and overhead transparencies.

"Energy Crisis"
13 minutes, 16mm, color, 1972 (Gr. 4-9)
Journal Films

Reviews the different energy sources and indicates the length of time we may be able to depend on them. Shows the possibility of solutions and developments which may some day provide unlimited power to meet our needs.

"Energy Crisis Game," 1973 (Upper elementary and junior high)
Intemation, Inc.
New York, New York 10001

For 2-6 players.

"Energy Game"
Northern Natural Gas"

Twenty minute slide and sound show followed by a quiz, designed for grades 4-6. The stress is upon energy conservation with a short review of where energy comes from.

"Energy With a Capital C - for Conservation"
Energy Policy Council
707 East Locust
Des Moines, Iowa 50319

Slide presentation complete with slides, audience pamphlets, and a recorded cassette of the slide narrative.

"First Film on the Wind"
9 minutes, 16mm, color, sound, c. 1966 (Elementary)
BFA Educational Media
2211 Michigan Avenue
Santa Monica, California 90404

Shows how, though one cannot see the wind, he can see what the wind does, such as making waves on the water, swaying trees, and lifting kites. Shows how rain clouds come and go with the wind.

"Global Emergency: Energy"
Guidance Associates, c. 1975 (Gr. 6)

Two sound filmstrips, "New Sources, New Values" and "The Energy-Aware Society," which deal with the various alternative sources of energy. It also looks at the social, economic, and political problems in our world of shortages. The students also look at alternative life-styles.

"The Great Search: Man's Need for Power and Energy"
13 minutes, 16mm, color, with teacher's guide, 1972 (Gr. 4-up)
Walt Disney Production

Traces history of man's attempts to harness energy of sun, water, lightning, etc. in order to produce power needed for daily living.

"Man's Search for Energy"
Filmstrip, 36 frames, $6.75 (Gr. 5-8)
McGraw-Hill Films
1220 Avenue of the Americas
New York, New York 10020

"Our Energy-Based Economy"
EEI Pub. No. 74-54
Edison Electric Institute

A multi-media instructional program for Gr. 6-8. Contains four filmstrips, four records, duplicating activity sheets, duplicating pre/post assessment sheets, and a teacher's guide.

"Our Energy Supply"
Part of The Only World We Have Series (Gr. 6)
Narrated by Dr. Leonard Reiffel and Miss Moones, Bell and Howell

Twenty minutes, two-part tape. Presents a wide variety of the problems relating to our energy usage. Covers definition of energy, present sources, explains origin of our energy problem, possible energy sources.

"The Petrified River"

Film available from Iowa Electric Light Company.

"Power"
Color filmstrip, 53 frames. Sound with cassette or record. (Intermediate - Junior High)
From Water and How We Use It Series, 1971
6 filmstrips with cassettes, $70.00; with records, $55.00
Coronet Instructional Films

Shows how water power helped the development of early industry and how water supplies power for hydroelectric energy from the water and how we use it.

"Power and Energy"
Set of two filmstrips, record or cassette, automatic and manual, $25.00 per set
18-20 minutes, color, 50-59 frames, with teacher's guide (Gr. 5-9)
Educational Activities

Answers such questions as: Where does energy come from? How is it produced and distributed? Why are there "Brown-outs?" How do you produce power from fossil fuels, fission, fuel cells, ocean, solar energy?

"A Practical Guide to the Energy Crisis," 1975
Schloat Productions Distribution Center
West Nyack, New York 10994

Two excellent color filmstrips, two records or cassettes. Part One: "Reasons for the Crisis," 89 frames, 10 minutes. Part Two: "Responding to the Crisis," 78 frames, 11 minutes. (Gr. 6-8)

"Science and Society: An Inquiry Into Technology and Values: Energy," 1975
Schloat Productions Distribution Center
West Nyack, New York 10994

Excellent sound filmstrip program containing two filmstrips with cassettes. Filmstrip I - "Power Struggle," 101 ft., 19 minutes. Filmstrip II - "Future Power," 103 ft., 19 minutes. (Gr. 6-8)

"This Earth: Everything Fits Together," 1973
Guidance Associates

Multi-media learning experience for the elementary years. Children see that everything is interdependent and that the sun is the energy source for all life on earth. Sound filmstrips, study cards, poster, game poster, stencils, work sheets, and teacher's guide.

"The World of Energy"
Filmstrip (Gr. 5-8)
National Geographic Society
Department 1037
Washington, D.C. 20036

TEACHER'S RESOURCE LIST

In addition to those listed below, specific suggestions are also included within the packets with the activities.

1. AEA - Area Education Agency

   Check their film and book catalogs and any other material they have available.

2. Chamber of Commerce

   Contact for help in locating local solar buildings and homes, industries which may be cooperative, etc.

3. C.U.R.E. (Citizens United for Responsible Energy)
   1342 30th Street
   Des Moines, Iowa 50311 (515/277-0253)

   Contact for information and speakers.

4. Iowa Energy Policy Council
   707 East Locust
   Des Moines, Iowa 50309 (515/281-4420)

   Contact for information and speakers.

5. School custodian.

6. Utility and Power Companies.

WILL YOU HELP US?

Use the following space for suggestions, criticisms, or comments. We welcome any contribution you may wish to make. Please send these to Duane Toomsen, Environmental Education Consultant, Curriculum Division, Department of Public Instruction, Grimes State Office Building, Des Moines, Iowa 50319.

Name _____

Address _____

City _____ State _____ Zip _____

School _____ Grade _____

How did you use the Packet?

Was it relatively easy to integrate the activities into existing studies?

What were your feelings about the values activities?

How could the packets be improved?